

AVESF
8.7
99.0
8/14/08

101 S. Capitol Boulevard, Suite 1900
Boise, Idaho 83702
main 208.389.9000
fax 208.389.9040
www.stoel.com

August 14, 2008

KEVIN J. BEATON
Direct (208) 387-4214
kjbeaton@stoel.com

Earl Liverman
United States Environmental
Protection Agency
1910 N.W. Boulevard
Coeur d'Alene, ID 83814

Re: Avery Landing Superfund Site, Avery, Idaho

Dear Earl:

Please find enclosed the original signature pages to the Administrative Settlement Agreement and Order on Consent(AOC) in the above-referenced matter. We have retained copies of the signature pages for our file.

If you have any questions or comments, please feel free to contact me.

Very truly yours,

Kevin J. Beaton

KJB:ww
Enclosure
cc: Pamela Mull w/enc.

USEPA SF



1315406

this Settlement Agreement, or to comply with all requirements of this Settlement Agreement, unless it is formally modified.

XXVII. NOTICE OF COMPLETION OF WORK

77. When EPA determines, after EPA's review of the Final Reports, that all Work has been fully performed in accordance with this Settlement Agreement, with the exception of any continuing obligations required by this Settlement Agreement, including payment of Future Response Costs or record retention, EPA will provide written notice to Respondents. If EPA determines that any such Work has not been completed in accordance with this Settlement Agreement, EPA will notify Respondents, provide a list of the deficiencies, and require that Respondents modify the Work Plan if appropriate in order to correct such deficiencies. Respondents shall implement the modified and approved Work Plan and shall submit a modified Final Report in accordance with the EPA notice. Failure by Respondents to implement the approved modified Work Plan shall be a violation of this Settlement Agreement.

XXVIII. INTEGRATION/APPENDICES

78. This Settlement Agreement and its appendices constitute the final, complete and exclusive agreement and understanding among the Parties with respect to the settlement embodied in this Settlement Agreement. The parties acknowledge that there are no representations, agreements or understandings relating to the settlement other than those expressly contained in this Settlement Agreement. The following appendices are attached to and incorporated into this Settlement Agreement: Map of the Site (Appendix 1) and Scope of Work (Appendix 2).

XXIX. EFFECTIVE DATE

79. This Settlement Agreement shall be effective the day the Settlement Agreement is signed by the Environmental Protection Agency.

The undersigned representative(s) of Respondents certify(ies) that it (they) is (are) fully authorized to enter into the terms and conditions of this Settlement Agreement and to bind the party(ies) it (they) represent(s) to this document.

Agreed this 24th day of July, 2008.

For Respondent Potlatch Corporation

By Brent Starnett

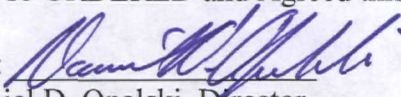
Title Vice President

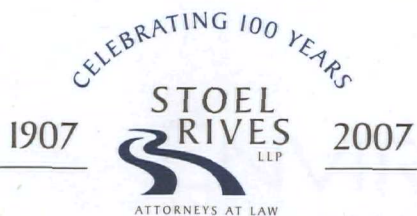
For Respondent Potlatch Forest Products Corporation

By Brent Stinnett

Title Vice President

It is so ORDERED and Agreed this 4th day of August, 2008.

BY:  DATE: 8/4/08
Daniel D. Opalski, Director
Office of Environmental Cleanup
Region 10
U.S. Environmental Protection Agency



101 S. Capitol Boulevard, Suite 1900
Boise, Idaho 83702
main 208.389.9000
fax 208.389.9040
www.stoel.com

August 19, 2008

KEVIN J. BEATON
Direct (208) 387-4214
kjbeaton@stoel.com

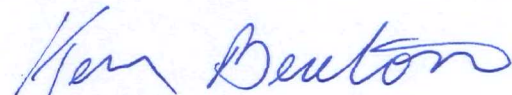
Earl Liverman
EPA Region 10 Environmental Cleanup Unit
U.S. EPA, Region 10
Coeur d' Alene Field Office
1910 Northwest Blvd., Suite 208
Coeur d' Alene, Idaho 83814

Re: Avery Landing Site, Order on Consent (AOC)

Dear Mr. Liverman:

Pursuant to Paragraph 12 of the subject AOC, Potlatch Corporation and Potlatch Forest Products Corporation (collectively "Potlatch") provides notice that it has retained Golder Associates, Inc. ("Golder") to perform the Work under the subject AOC. A statement of qualifications ("SOQ") is attached demonstrating Golder's qualification to perform the Work. Please note that Section 3 of the SOQ specifies how Golder will manage information and data consistent with the requirements of Paragraph 12. Further, pursuant to Paragraph 13 of the subject AOC, Potlatch has designated Terry W. Cundy as its Project Coordinator. Mr. Cundy's phone number is (208) 799-4135. Mr. Cundy's qualifications and related information are set forth in his attached C.V. Please advise as soon as possible if you have any questions about Golder or Mr. Cundy.

Very truly yours,



Kevin J. Beaton

KJB:ct
Enclosure



Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, Washington 98052
Telephone: (425) 883-0777
Fax: (425) 882-5498



**STATEMENT OF QUALIFICATIONS
SITE INVESTIGATION AND REMEDIATION SUPPORT
FOR THE AVERY LANDING SITE**

Submitted to

POTLATCH FOREST PRODUCTS CORPORATION

SPOKANE, WASHINGTON 99217

By

GOLDER ASSOCIATES INC.

SEATTLE, WASHINGTON 98052

August 8, 2008

073-93312

TABLE OF CONTENTS

	Page No.
1.0 Introduction	1
2.0 Overview of Golder Associates Inc.	2
2.1 Environmental Remediation Services	3
2.2 Representative List of Clients	4
3.0 Golder Experience Summary	5
3.1 Quality Control/Quality Management	5
4.0 Project Team	7

List of Tables

Table 1	Golder Associates CERCLA Site Experience
---------	--

List of Figures

Figure 1	Proposed Avery Landing Project Organization
----------	---

List of Appendices

Appendix A	Selected Project Descriptions
Appendix B	Resumes

1.0 INTRODUCTION

Golder Associates Inc. (Golder) is pleased to present this Statement of Qualification (SOQ) to Potlatch Forest Products Corporation (Potlatch) to assist in performing environmental investigation and related removal activities for Potlatch's Avery Landing site in Benewah County, Idaho (the Site).

We have prepared this SOQ to illustrate our ability to provide the full range of services that could be required with one integrated project team. However, we understand that not all of these services will be needed, and will refine the project team based on the scope requested by Potlatch.

Golder has a history of coordinating remedial efforts with local, state and federal regulatory agencies and responding to regulatory comments on behalf of the clients' concerns. Our proposed Project Manager, Dr. Douglas Morell, has extensive experience assisting clients on environmental matters. Dr. Morell has been the project manager or director at over 30 CERCLA and State site investigation and remediation projects. He is an expert in contaminant fate and transport analyses and natural attenuation evaluations.

Dr. Morell will be assisted by other senior professionals who will add their own regulatory, negotiation, and technical expertise and experience. Golder provides the technical basis for practical approaches to human health and ecological risk assessment and remedial action, so that protection of human health and the environment is achieved on the basis of reasonable cleanup levels and cost-effective remedial actions.

In summary, Golder offers Potlatch Corporation:

- Experience with the USEPA Region 10
- Expertise in northern Idaho geology and hydrogeology
- Local staffing for cost-effective fieldwork
- Site Remediation Technical Network, to bring Golder's global experience to the project
- A stable team of highly qualified individuals who have worked together many years
- Experience with complex sites
- Innovative and cost-effective investigation site remediation approaches
- In-house geophysics group
- In-house construction group
- Full service with one project team

2.0 OVERVIEW OF GOLDER ASSOCIATES INC.

Golder Associates Corporation (GAC) is a premier global group of consulting companies, specializing in ground engineering and environmental science. By servicing client needs and building strong client relationships, our people have made Golder one of the most trusted sources of professional services in the world. We have worked hard to earn our reputation, building on the quality of our professionals and the success of our clients. Operating as an employee-owned group since its formation in 1960, Golder has created a unique culture with pride in ownership and a commitment to providing technically sound and cost-effective consulting and contracting services. Golder has experienced steady growth for more than four decades and has more than 4,000 dedicated professionals operating in local companies, with offices across Africa, Asia, Australia, Europe, North America, and South America.

Golder Associates Inc. (GAI), the United States (U.S.) operating company, has more than 1,000 professionals staffed throughout more than 35 offices across the country. Given our expansive range of office locations throughout the U.S., we are able to understand your local concerns because we live where you live, we work in your community, and have the local experience to address the issues that matter to you. Our technical staff has expertise in the disciplines of hydrogeology; environmental sciences; geotechnical and civil engineering; earth, water, and air services; process and instrumentation design; regulatory analysis; and construction services. We have professional engineers and geologists registered in 47 states and the District of Columbia, many of whom have national and international registrations as well. A broad, in-depth base of expertise and knowledge allows Golder Associates to develop innovative solutions to complex technical problems. The result is an exemplary record of permit approvals, reduced costs, and timely completion of projects.

Golder Associates has a strong commitment to providing quality consulting services which blend **proven science and engineering skills** with **strong project management experience and capability**. These skills are combined with a **focus on client needs** to help our clients achieve their objectives.



2.1 Environmental Remediation Services

Golder offers a wide range of services for the successful completion of projects under CERCLA ("Superfund") and RCRA (hazardous waste) laws and regulations. Golder can cover all of the needs for a site remediation project:

- Site characterization/investigation
- Sediment sampling/remediation
- Geophysics
- Sediment chemistry and toxicology
- Remedial technologies selection
- Engineering feasibility and design
- Cost/benefit analysis
- Bench-scale and pilot-scale testing
- Environmental planning and permitting
- Impact assessment
- Risk assessment and decision analysis
- Public consultation and regulatory permitting
- Project implementation
- Project management
- Site preparation and logistics
- Materials procurement and installation
- Construction Quality assurance (QA/QC)
- Operations & Monitoring (O&M)
- Program design and execution
- Data analysis

2.2 Representative List of Clients

Golder Associates Inc. works for private and public sector clients throughout the world. Listed below are some of the world-class organizations for which Golder has executed environmental and engineering projects.

Anne Arundel County Maryland	Freedom Mortgage Company
BASF	General Electric
Bell Aerospace	Gerdau Ameristeel
Boeing	Global Landfill PRP Group
BFI/Allied Waste	G.R.O.W.S. Landfill
Borne Chemical Company	GlaxoSmithKline
Caldwell Trucking Superfund Group	Industri-Plex Superfund Site
Cecil County Central Landfill	Kardon Park PRP Group
Chester County Solid Waste Authority	Keystone Cement
Cinnaminson Groundwater Site	Mittal Steel (ISG)
Consolidated Rail	Mount Laurel Township
Cortese Landfill PRP	N.J. Department of Transportation
CP Rail	Olin Corporation
Crowley Maritime	Port Authority of N.Y & N.J
CSX	Passaic County, New Jersey
Cyprus Foote	Pfizer
Delaware Sand & Gravel	PSE&G
Delaware Solid Waste Authority	Republic Waste
DuPont Company	Rutgers Organics
Electrolux	Sharkey Landfill PRP Group
EnCap Golf Holdings	South Jersey Gas Company
ExxonMobil	Tullytown Resource Recovery Facility
FMC Corporation	Vulcan Chemical
Ford Motor Company	Waste Management
Frazier Quarry	

3.0 GOLDER EXPERIENCE SUMMARY

Golder has the required expertise and experience to support the needs of Potlatch Corporation for the Site. Golder's CERCLA site experience, which covers all USEPA regions, including Region 10, is summarized in Table 1. Selected project descriptions are provided in Appendix A. Additional project experience is shown in the resumes.

3.1 Quality Control/Quality Management

Golder Associates Inc. (Golder) management system establishes basic quality assurance requirements applicable to all Golder-managed projects, while ensuring that client-specific contractual requirements are fulfilled. This system is designed to support a wide variety of projects and contract types. It is particularly well-suited to the management of individual task or delivery order-type contracts, requiring review of each delivery order for specific regulatory and/or quality requirements, the appropriate assignment of personnel via written work instructions, and efficient allocation of resources, ensuring cost effective, timely, technically sound, and defensible completion of the work.

If requested, a quality program plan addressing the overall management of a master contract can be prepared. This program plan would draw from, but supersede the management system described above for the specified contract. In addition, as appropriate for environmental regulatory compliance, delivery order-specific quality project plans will be developed to ensure control of any environmental investigations and data collection activities that may be required. Golder has a wide range of experience in compliance with quality assurance standards including: ISO 9001, ASME NQA-1, DOE 5700.6C, NUREGs 1293, 1297, 1298, 1199 and 0856, EPA QAMS-005, EPA QA/R-5, and ANSI/ASQC E4.

All Golder plans and instructions are supported by technical and QA procedures drawn from Golder's Technical Procedures Manual and Quality Procedures Manual, current American Society for Testing and Materials (ASTM) or International Society for Rock Mechanics (ISRM) standards, USEPA reference methods, or other client-requested procedures necessary to appropriately manage, support, and execute the requested task or investigation. Golder's internal procedural resources have been developed and updated over the last 14 years, and have been proven in use for a broad range of geotechnical engineering and environmental investigations for the Corps of Engineers, DoD, USEPA, DOE, state, local government, and commercial clients. Many of Golder's procedures were developed in compliance with stringent Federal and state standards, including USEPA hazardous waste guidance and requirements documents and DOE and NRC radioactive waste management or facility investigation standards. Golder's Quality and Technical Procedures and other procedures will be provided upon request.

In summary, it is Golder's policy to provide high quality, cost-effective services which meet the needs of our clients, while continuously striving for excellence. This policy will be implemented through the application of Golder's existing management system, or a plan developed specifically for the overall management of a contract. In either case, the management system employed will address the technical and administrative requirements of the contract and will be supported by lower-tier work plans, instructions, and procedures as appropriate for the specific needs of the individual delivery orders.

Specific features of our quality management system that will be applied to task orders for this project include:

SOQ for Potlatch Avery Landing Site

- The goals, requirements, and constraints of the task order will be described to those personnel responsible for executing the work in a kickoff meeting or, for small task orders, individually by the Task Leader (QP-18.1 "Training and Orientation").
- All project correspondence, including incoming, outgoing, telecons, and email, will be logged and filed (QP-5.2 "Control of Correspondence and Communications").
- Design activities will be performed under a sequential process that includes defining functional requirements, preparing conceptual alternatives, preparing various levels of design (e.g., 60%), evaluating construction impacts, incorporating comments, and preparing final documents. The degree of complexity will be appropriate for the scope of each task order. Decision points and design criteria will be documented in meeting minutes, technical memos, or other format as appropriate (QP-4.1 "Design Control").
- When commercial software designed for a specific analytical function is used, such as slope stability or hydraulic modeling, it will be verified as performing correctly through the use of example problems with known solutions. Golder has an extensive library of previously verified software. For a particular application, a Software Application Memorandum will be prepared, documenting the software, machine, input data, and other pertinent aspects (QP-4.4 "Software Installation and Application Control").
- All technical work will be formally reviewed by an individual at least as qualified as the originator. Calculations will be checked and spreadsheets verified. Reviews will be documented on appropriate forms. Final reviews will be performed by a registered Professional Engineer (QP-9.2 "Technical Review" or QMP 10.3).
- Once a design document has been delivered to the client, it will be entered into the electronic Design Configuration Management System (DCMS). Hard copies will of course be filed. Access to the DCMS will be restricted to the Project Director, the Task Manager, and the Project Secretary. Future revisions of these documents will be based on copies of the previous version only. A complete record of deliverables and changes will be maintained in the DCMS to ensure continuity and traceability. Design documents subject to this level of control include design reports, construction drawings, and specifications (QP-4.5 "Design Configuration Management").
- Hard copy of all project records will be cataloged, filed, and stored in a fireproof vault with access limited to key individuals (QP-16.1 "Quality Assurance Records Management").
- The project will be audited internally by independent QA personnel to verify compliance with the requirements discussed above (QP-10.1 "Surveillance Inspection"). Where variances are identified, Corrective Actions will be completed (QP-14.1 "Corrective and Preventive Action").

4.0 PROJECT TEAM

Key project team members are shown with their roles in Figure 1. Resumes are provided in Appendix B. Roles and experience for key personnel are described below. We have included some specialized senior staff on the team who have developed an experience working with US USEPA and Idaho DEQ on previous similar projects. They will be integrally involved in the project. Fieldwork would primarily be staffed out of our nearby office in Coeur D'Alene, Idaho.

Golder's offices in Coeur D'Alene, Idaho and Redmond and Seattle, Washington maintain a large staff of scientists and engineers with extensive experience in characterizing the nature and extent of hazardous substance releases at sites in Idaho and elsewhere in the Northwest. This includes developing cost-effective cleanup strategies that provide comprehensive remediation and ensure regulatory compliance. Many of our staff have worked together on numerous CERCLA projects for over 10 years. As such, Golder is known for its well-coordinated and reliable team work approach to CERCLA projects. Golder CERCLA staff also work closely with scientists and engineers in other discipline area, such as fisheries, water resource evaluation, geophysics, and geotechnical engineering, further enhancing the value of our services to the regulated community.

If needed, Golder can involve our worldwide assemblage of experts, cooperating using our global computer intranet. This global system allows (at no cost to the project) information resources from our Site Remediation Technical Network (SRTN). This system brings to bear immediate knowledge and experience of our company to a specific site situation. Dr. Morell and Mr. Holder are on the steering committee for this technical network.

Douglas Morell, Ph.D., L.G, L.Hy.

Role: Project Manager

Golder's Principal-in-Charge will be Dr. Douglas Morell, from the Redmond, WA office. Dr. Morell has over 30 years of experience in contaminant hydrogeology/geochemistry and remediation throughout the Northwest. His role as Principal-in-Charge will be to develop an approach for the remedial investigation, respond to USEPA reports and comments, review all deliverables to Potlatch Corporation, and provide negotiations, as required, with USEPA on behalf of Potlatch Corporation. Dr. Morell will have overall responsibility for all technical and project elements.

Dr. Morell is a Principal with Golder and has over 30 years of experience in the fields of hydrogeology, environmental investigations, and hazardous materials management and site remediations. He has been the project manager or director at over 30 CERCLA and USEPA regulated investigation and remediation projects. Dr. Morell has much experience in managing and negotiating remediation sites with the USEPA Region 10 office. He has been the project manager on the various phases for the Success Mine remediation in the Silver Valley and cleanup activities at the Blackbird Mine in Salmon, Idaho. He has installed numerous wells in defining the groundwater flow pattern and extent of impacts from bulk petroleum fuel depots and abandoned oil refineries throughout the Northwest. Other remediation sites he has managed or been the Project Director in the Northwest include: Pasco Bulk Fuel Depot, Pend Oreille Mine Tailings Disposal Facilities, and Colbert Landfill.

He has experience managing difficult projects having multiple PRPs and stakeholders including several CERCLA RI/FS at Hanford, Silver Valley, and local landfills and repositories. He is an expert in contaminant fate and transport analyses and natural attenuation evaluations. He is experienced in providing expert testimony for contaminant impacts and remediation.

Lee Holder, P.E.***Role: Lead Engineer***

Mr. Lee K. Holder is an Associate Environmental Engineer with over 27 years of experience. Mr. Holder has extensive experience in all aspects of site investigation and remediation. He has managed and performed numerous Feasibility Studies throughout the U.S. He has managed and performed numerous remediation projects conducted under CERCLA, RCRA, and other federal and state regulations. Relevant experience includes:

Mr. Holder's site remediation experience includes:

- Blackbird Mine Site (Salmon, ID)
- Pasco Bulk Fuel Tank Farm design, construction, and O&M (Pasco, WA)
- White King / Lucky Lass Mines Superfund Site (Lakeview, OR)
- Anaconda Superfund Site (Butte, MT)
- Del Monte Superfund Site (Oahu, HI)
- Arkwood Superfund Site (Arkwood, AR)
- Onondaga Lake Superfund Site (Onondaga, NY)
- Tulalip Landfill Superfund Site (Marysville, WA)
- Hanford Nuclear Reservation (multiple operable units) (Richland, WA)
- Umatilla Army Base (multiple operable units) (Umatilla, OR)

Paul VanMiddlesworth***Role: Geologist/Geochemist***

Paul VanMiddlesworth is a Project Geochemist in Golder's Coeur d'Alene, Idaho office and has 11 years experience overseeing environmental and geotechnical drilling activities throughout the Northwest. Paul communicates with Idaho DEQ regulators on a regular basis to develop site remedial actions for local cleanup projects.

Paul's experiences include performing environmental site assessments, hydrogeologic characterization of contaminant migration pathways, sampling soils, surface waters, seeps and groundwater at mine sites and bulk fuel facilities, monitoring soil bioventing, soil vapor extraction and groundwater air sparging systems at hydrocarbon remediation sites, wetland delineation, and coordinating remedial actions and cleanup efforts with local, state, tribal, and federal environmental regulators. Mr. VanMiddlesworth has an excellent understanding of the local and regional geology and hydrogeologic conditions of the Northwest and has performed a plethora of environmental, hydrogeologic and geotechnical investigations throughout northern Idaho and eastern Washington. Recent projects include:

- Remedial investigation field activities at mine sites
- CERCLA site investigations at timber facilities
- Groundwater monitoring at bulk fuel storage sites and industrial facilities
- Monitoring and maintaining soil bioventing and groundwater air sparging systems at hydrocarbon impacted sites
- Geotechnical investigations at commercial and industrial sites
- Phase I and II environmental site assessments.

Mr. VanMiddlesworth is also formally trained in aqueous geochemistry with special interests in fate and transport modeling of metals and inorganic complexes in groundwater systems. Additionally, he has a multitude of experience supervising environmental drilling activities, managing site remedial investigation activities, and coordinating remedial action and cleanup efforts with the USEPA, IDEQ and Tribal environmental regulators. Mr. VanMiddlesworth will serve as Golder's Field Investigative Team Leader and Site Health and Safety Officer to direct exploration drilling and test pit activities. He is currently working on remediation sites involving Idaho DEQ oversight.

Bryony Stasney, L.G., L.Hy.

Role: Hydrogeologist

Ms. Stasney is a licensed geologist and hydrogeologist in Washington and has been based in Golder's Coeur d'Alene office since 2000. Bryony has worked on a number of remedial investigations and surface water and groundwater compliance monitoring projects that have given her the practical experience needed to efficiently assist the team. She has been actively involved in the Coeur d'Alene River Basin remedial investigations and negotiated cleanup activities with mining companies, local, state and federal regulating agencies, the Coeur d'Alene Tribe and the local communities to develop and communicate with the public on the optimum response alternative to minimize heavy metals migration into surface waters. Ms. Stasney will be responsible for assisting the team with coordinating, conducting, and reporting for field investigations. Her recent project experience includes:

- Remedial investigation and construction management activities at the Success Mine and Mill;
- Tailings removal and floodplain revegetation at Osborn Flats;
- Soil lysimeter studies, riverbank stabilization pilot tests, water quality studies, and metal loading assessments in the Coeur d'Alene River;
- Compilation and assessment of hydrogeologic information for the Spokane River, Pend Oreille River, Palouse River and Hangman Creek Watersheds;
- Remedial Investigation / Feasibility Study (RI/FS) fieldwork and reporting under the oversight of Washington Department of Ecology.

Donna DeFrancesco

Role: Biologist

Ms. DeFrancesco is a Senior Biologist in Golder's Coeur d'Alene, Idaho office. She provides expertise in technical and policy areas of ecological and biological sciences. She has over 14 years experience in managing and conducting studies in preparation of documents pursuant to Clean Water Act (wetlands and water quality), National Environmental Policy Act, Washington Watershed Planning Act and Endangered Species Act. Her specific focus includes: riparian and wetland ecology; the function, management, rehabilitation mitigation and planning of watersheds and aquatic systems, and environmental permitting and impact assessment associated with aquatic systems. She provides services in baseline assessment, environmental impact assessment, mitigation planning and implementation,, monitoring, watershed and habitat planning, in-stream flow needs assessment, water quality, sediment source identification, wetland delineation, stream restoration, and adaptive management planning and permitting for water resource, mining, power, transportation, land development, and agriculture clients. Ms. DeFrancesco will assist with Avery Landing Site if ecological issues need to be addressed.

Tim Martin, P.E. in Washington***Role: Geotechnical Engineer***

Mr. Martin is Principal in Golder's Coeur d'Alene, Idaho office. He has over 20 years of diverse experience in geotechnical and environmental engineering. His experience includes both hydrogeological and geotechnical investigations related to site characterization, USACE wetland/mitigation and permitting, stormwater management, construction monitoring, and environmental permitting and compliance. For the past 20 years, he has been heavily involved in planning and design of waste containment facilities, including hazardous, municipal, mine tailings, and low-level radioactive waste facilities. He has significant design and review responsibilities with projects involving geomembrane installation, geotechnical foundation design, road and pavement design, tailings impoundments, hydrologic isolation of wastes, landfill closure covers, specifications and bid packages, cost estimates, permit applications, and remedial designs.

John (Hank) Swift, P.E.***Role: Geological Engineer and Construction Manager***

Mr. Swift is a Senior Engineer in Golder's Coeur d'Alene, Idaho office. He has more than 18 years of experience in the design and construction of a wide variety of remediation projects. Mr. Swift has prepared bid and construction documents, and specifications. He has regularly performed geotechnical and constructability reviews for many projects designed by Golder Associates Inc. as well as others. He has also acted as the construction superintendent/engineer for design-build projects. Mr. Swift regularly prepares, implements, and manages project specific health and safety plans.

Mr. Swift brings construction as well as engineering experience to the design process. This construction experience has enabled him to design very constructible features that are easier and less costly to construct and maintain. His experience includes designing and constructing projects to CERCLA, RCLA, USEPA, and USACOE guidelines. Mr. Swift is registered as a professional engineer in the states of Idaho, Oregon, Washington, and Montana.

Mr. Swift has performed construction management (CM), project management, construction quality assurance (CQA), as well as design and field engineering. He has developed field data collection and management programs for construction quality assurance and field engineering projects. He has performed engineering and construction cost estimating, budget tracking, project report preparation, and the supervision of staff and project level engineers and geologists, as well as technicians.

Richard Sylwester***Role: Senior Geophysicist***

Mr. Sylwester is a senior geophysicist with over 35 years of experience in all aspects of geophysical operations. As the Geophysics Group Leader at Golder he is responsible for planning and directing terrestrial, borehole, and offshore geophysical programs. His geophysical expertise includes seismic methods, ground penetrating radar, electrical resistivity, and magnetic and electromagnetic, borehole conductivity, optical and acoustic televiewer. He has conducted more than 300 geophysical investigations for geotechnical and environmental projects that included mapping groundwater and subsurface stratigraphy, mapping the aerial extent of subsurface constituents, locating underground storage tanks, fuel lines and utilities, and mapping subsurface voids.

Audrey Wagenaar***Role: Human Health Risk Assessment***

Ms. Wagenaar is a Senior Environmental Scientist with over 14 years of experience in human health risk assessment. She has conducted public health risk assessments for the Agency of Toxic Substances and Disease Registry (ATSDR) at several military CERCLA sites. She was also the principal human health risk assessor responsible for a risk assessment of multiple contaminants of concern at a 44-acre CERCLA site located in Washington DC. This site will be redeveloped into a recreational park within the National Park system. Ms. Wagenaar has completed toxicity reference value derivation for novel substances at a former chemical manufacturing site now undergoing RCRA investigation in Connecticut. In addition, Ms. Wagenaar recently conducted a detailed human health risk assessment to assess the uptake of contaminants (metals, mercury, PAHs, and pesticides) from sediment by fish as the result of proposed dredging activities in Port Philip Bay, Melbourne, Australia, and the subsequent consumption of these fish by recreational and subsistence fisher populations.

Ms. Wagenaar was involved in several human health risk assessments of towns impacted by elevated levels of a range of constituents, including mercury. In these projects she provided expert advice on toxicological issues to the local medical health officers. Ms. Wagenaar has conducted multiple human health risk assessments in accordance with US federal and state guidelines. She has experience in managing complex multi-stakeholder processes involving industrial clients, government regulatory agencies, and the public. She is also experienced in human health risk communication.

Lawrence Kapustka, Ph.D.***Role: Ecological Risk Assessment and NRDA***

Dr. Kapustka is a leader in developing and providing functional approaches to risk assessment. He is an active participation in professional societies that promote the development and use of risk assessment approaches and methods. Relevant experience and achievements include:

- Performed environmental risk assessments on large sites in Idaho, Montana, Utah, Oregon, Arizona, Nevada, New Mexico, Washington, Wyoming, and Canada.
- Developed training materials and presented workshops on environmental risk assessment to USEPA Regional Offices involved in Superfund site assessments.
- Contracted by the United Nations Environmental Program – International Environmental Technology Centre (IETC) to write a technical paper on the incorporation of Environmental Risk Assessment into the Sustainable Cities Programme.
- Invited speaker and workshop participant for the USEPA Science Advisory Board review of the state of the science of Ecological Risk Assessment; focused on limitations of the practice and ways for improvement
- Co-authored issue papers for the International Council on Metals and the Environment (ICME, now evolved into ICMM) on a classification system for ranking hazards of metals
- Active in developing standardized test methods and using them to evaluate toxicity of metals and other materials in soils, sediments, and waters
- Contracted to develop a streamlined risk-based decision approach to guide Alberta Environment with its Applications Approval Process.
- Invited participant to three NATO Advance Research Workshops addressing Risk Assessment and Decision-making processes regarding Environmental Management and Environmental Security issues.

Charles Haury***Role: Health and Safety Program Manager***

Mr. Haury is a certified industrial hygienist (CIH), and certified safety professional (CSP). He currently serves as the Golder's U.S. Corporate Health and Safety Officer in addition to his project work. He has over 20 years of experience in providing solutions to complex and diverse health and safety issues. He has extensive experience in OSHA regulatory issues, asbestos and lead management, personal protective equipment, and indoor environmental quality. Mr. Haury has provided expert testimony on toxic exposures.

TABLE

Golder Associates
CERCLA Site Experience

EPA Region	State	Site	Services
1	MA	Woburn Industri-Plex	Remedial Design & Construction Management
1	MA	Charles George Landfil	Review of Remedial Design
1	MA	Shaffer Landfill	Technical Support of ROD Negotiation
1	MA	Mass. Military Reservation	Zero-Valent Metal Treatment Wall, Natural Attenuation
1	MA	Silresim	Technical Support of FS - groundwater modeling
1	NH	Coakley Landfil	Remedial Design & Resident Engineering/CQA
1	NH	Dover Landfill	Remedial Design
1	RI	Landfill (Confidential)	Probabilistic Remedial Cost Estimation
1	RI	Western Sand & Gravel	Construction Coordination, Closure QA/QC
2	NJ	Landfill and Development Co	Landfill Gas System Expansion Design
2	NJ	Landfill (Confidential)	Probabilistic Remedial Cost Estimation
2	NJ	Cinnaminson Groundwater	PDI, RD/RA for Groundwater Extraction and Natural Attenuation, Resident Engineer, Construction Management, and O&M
2	NJ	Global Landfil	FS Review and Remedial Design
2	NJ	Helen Kramer	FS Review
2	NJ	Monroe Township Landfill	FS and Post-Closure Monitoring, Remedial Action Construction, CQA
2	NJ	South Brunswick Landfill	Post-Closure Investigation, Post-Closure Monitoring, Remedial Design, Remedial Action Construction
2	NJ	Tabernacle Drum Dump Site	PDI and RD (groundwater extraction system)
2	NJ	SCP Carlstadt	Facility Coordinator, Supplemental RI, O&M, Treatability Study, Focused FS, CD Negotiation and Remedial Design
2	NJ	Sharkey Landfil	RD/RA, Resident Engineering, Contract Management, CQA, Litigation Support
2	NJ	Caldwell Trucking	Alternate Remedial Plan, PDI, RD, Remedial Construction, Treatability Study, F
2	NJ	PJP Landfill	RD/RA, Resident Engineering, Construction Management/CQA
2	NJ	Woodland Superfund Site	MNA monitoring program design/O&M monitoring
2	NJ	Woodbrook Road Dump	ACO Negotiation
2	NJ	Lightman Drum	RI/FS, Risk Assessment, and Pilot Study
2	NY	Hooker (102nd Street)	FS Review
2	NY	Love Canal	FS Review
2	NY	Cortese Landfill	RI/FS, RD/RA, Resident Engineer, CQA
2	NY	PAS Oswego	Supplemental RI/FS
2	NY	Landfill (Confidential)	Probabilistic Remedial Cost Est., Tech Support & Allocation Issues
2	PR	Barceloneta Landfil	RI Completion/FS
2	PR	Vega Baja	ACO Negotiation, RI/FS, Risk Assessment
2	VI	Virgin Island Chemical	RI Review, FS and Risk Assessment Completion, RD/RA
3	DE	Confidential Site	Probabilistic Remedial Cost Estimation
3	DE	Delaware Sand & Grave	Hydrogeologic Investigation and Expertise, O&M Monitoring
3	PA	Landfill (Confidential)	Probabilistic Remedial Cost Estimation
3	PA	Landfill (Confidential)	Probabilistic Remedial Cost Estimation
3	PA	Berks County	RI/FS, Risk Assessment, IRM, RD, Construction Management, O&M
3	PA	Centre County Kepone Site	RI/FS, PDI, RD, ROD and CD Negotiations, SVE Pilot Testing, RA, Resident Engineering/CQA, Construction Management, Ecological Assessment, SVE design
3	PA	Elizabethtown Landfil	RI/FS, Revised Remedial Plan, Natural Attenuation, RI
3	PA	Modern Landfill	RI/FS, Remedial Design, Well Installation, Extraction System Replacement, Construction Management, RA Completion
3	PA	Crater Resources	HRS Review
3	PA	Bell Landfill	Remedial Design, Remedial Action Construction, Resident Engineering, CQA
3	PA	Keystone Landfil	FFS, Re-ROD, Remedial Design, CQA
3	PA	Malvern TCE	PDI, FS, Remedial Design, Negotiation of Remedy Change
3	PA	Folcroft Landfil	RI/FS
3	PA	North Penn Area 7	RI/FS
3	PA	Foote Mineral	Litigation Support
3	VA	Abex Foundry	RI/FS Review

Golder Associates
CERCLA Site Experience

EPA Region	State	Site	Services
3	VA	Saltville Waste Disposal Pond	RI/FS, PRAP/ROD Negotiations, RD Support, Supplemental RI/FS Studies
3	VA	Avtex Fibers	Hydrogeologic Interpretation and FS assistance
4	AL	T.H. Agriculture & Nutrition	Site Investigation, Hazard Ranking Review
4	AL	Anniston PCB Site	Removal Action
4	FL	Hipps Road Landfil	RI/FS Data Review, ROD & AROD Negotiations, RD, RA, Construction Management, O&M
4	FL	Pickettville Road Landfil	Remedial Design/Remedial Action/PRP Group Coordinator, Construction Management, O&M
4	FL	Sydney Mine Site	Contamination Assessment Review
4	FL	Madison County Landfil	Remedial Design/Remedial Action, and O&M
4	FL	Whitehouse Waste Oil Pit	Investigation/Supplemental TS/FS, Resident Engineer, CQ
4	FL	Holmstead AFB	Technical Support - RI Task
4	FL	Florida Petroleum Reprocessor	Source Removal/Expanded Site Investigation/Focused FS/ROD Negotiation
4	GA	Diamond Shamrock Landfil	Removal Action Management, RI/FS
4	GA	T.H. Agriculture & Nutrition	Site Investigator
4	NC	Jadco-Hughes Facility	RI/FS Work Plan
4	SC	Medley Farm Drum Dump	Hazard Ranking Review
4	SC	SCRDI Bluff Road	RI/FS
5	IL	DePue	RI/FS, RD
5	IL	Belvedere Municipal Landfil	RI/FS, RD/RA
5	IL	Crab Orchard	RI, Ecological Assessment
5	IL	Cross Brothers Pail Recycling	Pre-Design Investigation, RD/Construction Mgmt
5	IL	Interstate Pollution Control	RI/FS and 3rd Party Removal Action Oversight
5	IL	Johns-Manville Corp	Alternative RD
5	IL	MIG/DeWane Landfil	RI/FS Work Plan/Interim Action
5	IL	Main Street Well Field	Client Advocacy/Negotiation
5	IL	Outboard Marine Corp.	Conceptual RD
5	IL	Tri-County Landfil	Client Advocacy/Negotiation
5	IL	Yeoman Creek Landfil	RI/FS
5	IL	Landfill (Confidential)	Probabilistic Remedial Cost Estimate
5	MI	Cork Street Landfil	RD
5	MI	Electrovoice	RD/RA
5	MI	West K L Avenue Landfil	Pre-Design Investigation and RI
5	MI	Landfill (Confidential)	Probabilistic Remedial Cost Estimate
5	OH	Montville Landfil	RD, Resident Engineer, CQA, O&M
5	OH	Nease Chemical, Saler	RI Completion, FS, CD Negotiation Support, Interim Measures Design, CM, Litigation Support
5	WI	Landfill (Confidential)	Probabilistic Remedial Cost Estimate
5	WI	Landfill (Confidential)	Probabilistic Remedial Cost Estimate
6	OK	Mosley Road	Consent Order Negotiation, RI/FS Work Plan, RI/FS
6	OK	Hardage/Criner	RI/FS, Packer Testing, Hydrogeo Modeling
6	OK	Johns-Manville Corporation	RI/FS Review, Packer Testing, Groundwater Modeling
6	NM	Chino Mine	RI/FS, Groundwater Modeling
6	NM	Los Alamos	RI/FS
6	TX	Chemical Recycling Inc.	Site Characterization - Soil/Groundwater/Sediment Investigations
7	IA	Chemplex	CD Negotiation and Remedial Design (Cap/SVE), Construction Services, O&M
7	KS	Neodesha	Design of the Closure of Waste Lagoon
7	MO	Westlake Landfil	Review and performance of RI/FS
8	AZ	Confidential Site	Third Party Review, Remediation progress for closure.
8	CO	Lowry Landfil	RI, RD, Construction Services
8	CO	California Gulch	Site Investigation, Risk Assessment, community relations, innovative lead program, feasibility studies, EE/CA's.
8	CO	Rocky Flats	Environmental Monitoring

Golder Associates
CERCLA Site Experience

EPA Region	State	Site	Services
8	CO	Rocky Mountain Arsenal	Data Review, Remediation & Landfill Design, CQ
8	CO	Sand Creek	Probabilistic Risk Assessment
8	CO	Summitville	Analysis of Treatment System
8	CO	Big 5 Mine Waste	Remedial Design and CQA
8	MT	Wood Treatment Site	Technical Support, Expert Testimony
8	ND	George AFB	Geophysical Data Processing
8	UT	Monticello Uranium Mill	Site Investigation
8	UT	Rose Park Sludge Pit	Site Investigation, Well Installation, RD, RA Plan
9	CA	EG & G Idaho, Inc	Soil Vapor Survey, Treatment Specs. Support
9	CA	Hillview-Porter	Third Party Review, Hydrogeology, RI
9	CA	Intel	Site Investigation
9	CA	LLNL	CQA, Design of the Closure of Test Pit
9	CA	Naval Petroleum Reserve	RI/FS, Regulatory Support, Program Planning
9	CA	Raytheon Corp.	Hydrogeology, RD, Construction Management
9	CA	Landfill (Confidential)	Probabilistic Remedial Cost Estimation
9	HI	Del Monte Corp. (Oahu Plantation)	RI/FS, Regulatory Support, Risk Assessment, Treatability Study
10	ID	Argonne National Laboratory	Preparation of Sampling and Analysis Plan
10	ID	Argonne National Laboratory	Site Investigation
10	ID	EG & G Idaho	Sampling and Analysis Plan, EM-Survey, Sampling, Track 2 Summary Report
10	ID	Blackbird Mine	Early Action, RI/FS, CM, Eco. Risk Assessment, NRD Biological Restoration
10	ID	EG & G Idaho	Track 1 Decision Documents
10	ID	EG & G Idaho	Track 1 and 2 Risk Assessments
10	ID	EG & G Idaho	Survey of all Wells for Compliance
10	ID	EG & G Idaho	RI, Risk Assessment
10	ID	Monsanto - Soda Springs	RI/FS
10	ID	Westinghouse Idaho Nuclear Co	Soil Sampling, Work Plans, Closure Plan
10	ID	Westinghouse Idaho Nuclear Co	Radar Surveys
10	ID	Westinghouse Idaho Nuclear Co	Installation of Monitoring Well
10	ID	Westinghouse Idaho Nuclear Co	Track 2 Investigation and Risk Assessment
10	OR	Wood Treatment Site	Technical Support, Expert Testimony
10	OR	White King / Lucky Lass Site	Design, Construction Management, CQA, Ecological Risk Assessment
10	WA	Colbert Landfill	RI/FS, ROD Negotiation
10	WA	North Market Street Site	Remedial Investigation
10	WA	Commencement Bay	Site Investigation, Interim RI
10	WA	General Electric (Spokane Shop)	RI, Data Reviews, Supp. FS, Negotiation/Modification of ROD, Compliance Monitoring
10	WA	Greenacres Landfill	Seismic Survey
10	WA	Hanford 100-Area	Multiple RI Work Plans, RI Reports, Risk Assessment
10	WA	Hanford 200-Area	Multiple RI Work Plan, RI/FS, Design of Radioactive/Mixed Remed. Waste I
10	WA	Hanford 300-Area	Multiple RI Work Plans, Multiple RI/FS, Remedial Design
10	WA	Hanford 1100-Area	RI Data Evaluation, RI Report Preparation
10	WA	Harbor Island	GP Radar Survey
10	WA	Kent Highlands Landfill	Site Investigation, Data Review
10	WA	McChord AFB	Geophysical Investigation
10	WA	Midway Landfill	RI Work Plan, Data Analysis
10	WA	Naval Undersea Warfare Station	Geophysics Survey
10	WA	Northside Landfill	RI Work Plan
10	WA	Queen City Farms	Prelim. Design of Barrier Wall, Hydrogeologic testing & modeling, C
10	WA	Tulalip Landfill	Review of draft RI/FS Work Plan, F
10	WA	Western Processing Co., Inc.	Data Review

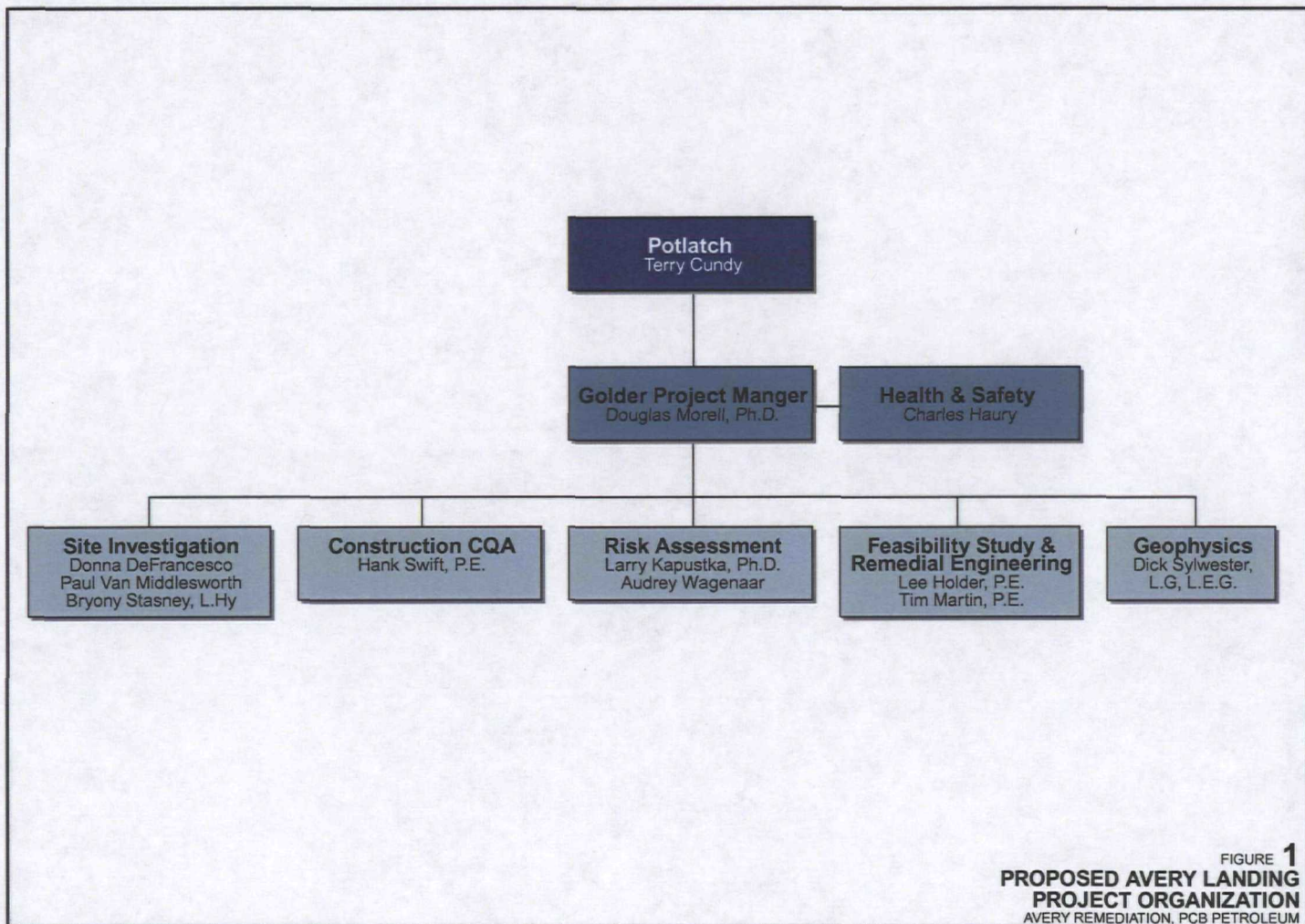


FIGURE 1
**PROPOSED AVERY LANDING
PROJECT ORGANIZATION**
AVERY REMEDIATION, PCB PETROLEUM

APPENDIX A
SELECTED PROJECT DESCRIPTIONS



Wetland Delineation and Permit Application, St. Maries Complex, St. Maries, Idaho

Client:

Potlatch Forest Products
Corporation

Contact:

Don Hejna,
Bernie Wilmarth
Tel: 218 759-4304

Key Personnel:

Donna DeFrancesco
Jim Renner
Beth Duvall
Judith Hillis
Tom Hoffert
Paul Van Middlesworth
Tim Martin



The goal of the project is to expand a log storage/sorting yard on the Potlatch St. Maries Complex plywood mill site in Benewah County, ID. The proposed project includes a log storage/sorting yard expansion, construction of road crossing of ditch and stormwater management.

Golder Associates were retained by Potlatch Forest products Corporation in 2007 to complete a wetland delineation of the 50 acre site adjacent to the St. Joe River for the proposed log storage/sorting yard. The project is located within the boundaries of the Coeur d'Alene Indian Reservation. Over 40 acres of floodplain wetland were identified on the site. Golder Associates was retained for subsequent completion of an individual 404 Joint Permit Application related to proposed wetland impacts in the proposed Project Area.

The permit application development was fast tracked and Golder worked cooperatively with Potlatch staff to complete the application on schedule. The following tasks were completed by Golder in April 2007:

- Pre-application with the Corps of Engineers;
- Completion of the Joint Permit Application and supporting material;
- Section 106 - Cultural resources investigation;
- Threatened and Endangered Species information review and biological assessment; Section 404(b)1 Alternatives Analysis;
- Conceptual mitigation plan.



Golder and Potlatch completed weekly progress conference calls and brainstorming sessions; and Potlatch staff provide significant information and review process during the application development to maintain the project schedule and application details.

Golder and Potlatch coordinated with the Army Corps of Engineers, the US EPA, and the Coeur d'Alene Tribe throughout the application process. The application was submitted in early May 2007.

A site visit was completed by Potlatch, Golder and the agencies in July 2007. Minimal comments focusing on only the mitigation plan details were received by the agencies.

The permit application was recently sent for public comment. Golder is currently working with Potlatch to provide additional mitigation plan details to the agencies



South Fork Coeur d'Alene River Response Actions Kellogg, Idaho

Client:

Silver Valley Natural Resource
Trustees, Kellogg

Contact:

Marti Calabretta
Tel: (208) 786-2471
Chuck Moss
Tel: (208) 334-3645

Key Elements:

Remedial Investigation
Treatability Studies
Alternative Selection
Remedial Design
River Stabilization
Construction Oversight
Geotechnical Engineering
Remedial Design
Monitoring

Key Personal:

Douglas Morell, PhD., L.G., L.Hy.
Bryony Stasney, L.Hy.
Hank Swift, P.E.
Frank Shuri, P.E.

Golder Associates Inc. has been assisting the Silver Valley Natural Resource Trustees (comprised of representatives from Idaho State, Shoshone County, several mining companies, the Coeur d'Alene Tribe, BLM, EPA and citizens) to restore the South Fork Coeur d'Alene River and its tributaries for aquatic and riparian life and to reduce human exposure to residual metals in soil and surface water resulting from previous mining practices. The projects are voluntary actions under CERCLA with EPA oversight. Golder has provided a variety of professional services for several projects over the past 5 years including:

- investigation and characterization of soil, surface water and groundwater,
- treatability studies,
- evaluation of remedial strategies,
- remedial designs,
- river channel stabilization,
- groundwater capture and treatment,
- wetland / riparian habitat development,
- negotiations with regulatory agencies and Indian Tribes,
- preparation of contractor bid packages, and
- Construction supervision.

Osburn Flats Response Action

As a result of the floodplain characterization, the Osburn Flats reach of the river was selected by the Trustees as the site for a 1998 remedial response action.

**Bare Floodplain at Osburn Flats Prior to Floodplain Reconstruction (June 1997)**

Golder assisted the Trustees in the development of the Osburn Flats scope of the work, which included:

- site investigation involving test pitting and soil sampling to determine the extent of the tailings;
- excavation of 90,000 yd³ of tailings from the active flood plain;
- design and development of a secure tailings repository and cap above the floodplain on a closed tailings disposal area about 0.5 mile haul from the floodplain;
- river stabilization and establishment of a back-bar channel;
- enhancement of wetland/riparian habitats in the floodplain; and,



South Fork Coeur d' Alene River Response Actions Kellogg, Idaho

Client:

Silver Valley Natural Resource
Trustees, Kellogg

Contact:

Marti Calabretta
Tel: (208) 786-2471
Chuck Moss
Tel: (208) 334-3645

Key Elements:

Remedial Investigation
Treatability Studies
Alternative Selection
Remedial Design
River Stabilization
Construction Oversight
Geotechnical Engineering
Remedial Design
Monitoring

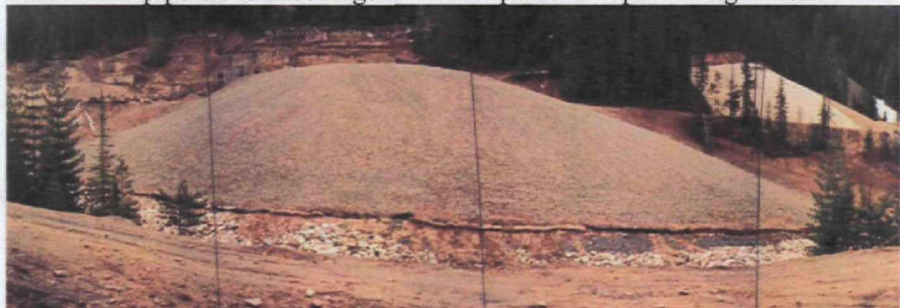
Key Personal:

Douglas Morell, PhD., L.G., L.Hy.
Bryony Stasney, L.Hy
Hank Swift, P.E.
Frank Shuri, P.E.

- design and implementation of a pilot soil amendment study as a component of upland habitat restoration on the terraces and slopes above the floodplain.

Interstate Mill Tailing Response Actions

Golder performed all site investigations, designs and bid packages for the remedial actions at the Interstate Mill site during 1998 and 1999. The lateral and vertical extent of the tailings at the site were determined cost effectively (quickly, cheaply and with a high degree of confidence) using test pitting, soil sampling and geophysics. 60,000 yd³ of tailings were excavated and placed in a hydrologically isolated on-site repository. The repository was designed with a coarse rock basal pad and chimney along the mountain side that elevated the tailings above the groundwater level (100 year creek flood level) and diverted clean surface water run-on beneath the tailings. The tailings were also capped with low permeability soil and armor rock according to NRC design specifications developed to provide 1,000+ years of containment for uranium mill tailings. As a result, the Interstate Mill site repository will need minimal maintenance over the long term. Creek channel and riparian habitat improvements were also completed during these remedial actions. The improvements involved placement of boulders and large woody debris to create sediment trap ponds to encourage the development of riparian vegetation.



Completed Interstate Repository in May 2000

South Fork Coeur d'Alene River and Floodplain Characterizations

Two projects involved soil and water sampling and discharge measurements along a seven mile reach of the South Fork CdA River and 12 mile reach of CdA River to determine the location and magnitude of non-point source loading of metals to the river. Laboratory analysis of about 150 samples was followed by selected leachability testing of mine tailings taken from active depositional areas in the floodplain. The results were used to prioritize areas to be considered for remedial action and to develop strategies for remedial action implementation and habitat enhancement projects.

Fisco – Gem Tailings Remediation

Golder designed and developed the bid package for the excavation and removal of about 100,000 yd³ of tailings impacted soils from Canyon Creek. Tailings were deposited in the Canyon Creek Repository.



South Fork Coeur d' Alene River Response Actions Kellogg, Idaho

Client:

Silver Valley Natural Resource
Trustees, Kellogg

Contact:

Marti Calabretta
Tel: (208) 786-2471
Chuck Moss
Tel: (208) 334-3645

Key Elements:

Remedial Investigation
Treatability Studies
Alternative Selection
Remedial Design
River Stabilization
Construction Oversight
Geotechnical Engineering
Remedial Design
Monitoring

Key Personal:

Douglas Morell, PhD., L.G., L.Hy.
Bryony Stasney, L.Hy
Hank Swift, P.E.
Frank Shuri, P.E.

Dudley CdA River Bank Stabilization Structures

Golder designed and permitted two 750 ft. in-stream rock structures at Dudley to stabilize bankerosion of tailings impacted soils to the river. Each structure has unique design features and Golder is currently monitoring their effectiveness.

South Fork CdA River Tailings Removal

Golder designed and developed a bid package for the excavation and removal of "hot spot" tailings accumulations along the flood plain of the South Fork CdA River. The hot spot removals were located from Silverton to the confluence of Big Creek and were deposited within the CIA in the Bunker Hill Superfund site.

Client:

Blackbird Mine Group

Contacts:

Dan Myers, Noranda
Mining, Inc.,
Tel: (208) 756-8688

Dave Jackson, Coordinator
for Alumet
Tel: (303) 838-0700

Period of Performance:

1994 to present

Contract Amount:

\$13 Million to date

Key Personnel:

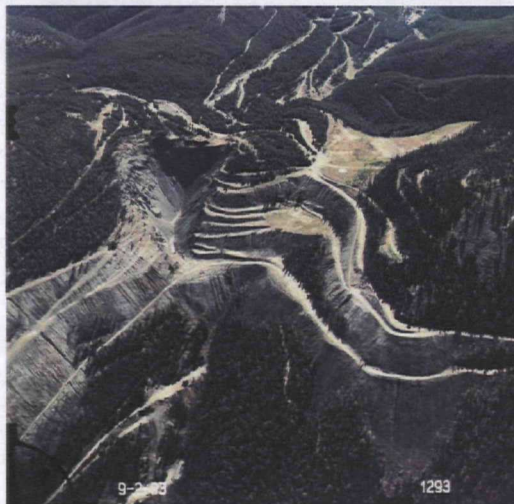
Mike Brown
Doug Dunster
Dave Findley
Josh Ford
Lee Holder, P.E.
Joe Kennedy
John Liu
Richard Luark, P.E..
Dave O'Malley
Douglas Morell, Ph.D.
Cheryl Ross
Frank Shuri, P.E.
Tom Stapp
Hank Swift, P.E.
Stella Swanson, Ph.D.
Cathy Smith, P.E.
Lisa Vaughn
Rens Verburg, Ph.D.

General

Golder has conducted Early Response Actions, a Remedial Investigation & Feasibility Study (RI/FS), Ecological Risk Assessment, Removal and Remedial Designs, and Construction

Management and Quality Control services since 1994 at the Blackbird Mine site in Lemhi County, Idaho. The site has been nominated for listing on the National Priorities List (NPL)

under CERCLA and was also the subject of a Natural Resource Damage (NRD) claim and settlement between the mining companies and the Natural Resource Trustees. Golder is also implementing portions of the Biological Restoration and Compensation Plan required by the NRD Consent Decree.



This former copper/cobalt mine was the source of copper and cobalt loading to Panther Creek, a tributary of the Salmon River, due to seepage from acid-generating waste rock piles, tailings and adit drainage. This metals loading resulted in exceedance of water quality criteria and impacted populations of Snake River spring/summer run Chinook Salmon and steelhead trout, both of which are listed as threatened under the Endangered Species Act (ESA). In addition, large volumes of tailings containing unacceptable levels of arsenic were released from the historic mining activities affecting overbank areas on both public and private property along miles of Panther Creek and tributary streams.

The remediation of the site was implemented initially as a series of Early Actions, followed by the RI/FS and biological restoration program. The objective of the Early Action work was to define the most effective alternative, design the work, and construct it to quickly reduce the loading of copper and cobalt to allow re-introduction of anadromous salmonids to Panther Creek. In addition, Early Actions were conducted to remove tailings deposits containing unacceptable concentrations of arsenic from stream banks and deposition areas. In conjunction with and following completion of the Early Actions, investigations were conducted to determine residual metals contamination for the human health and ecological risk assessments and to select and design the final remedy in the RI/FS and Record of Decision, which was issued February 2002.

Early Actions

Early Actions were developed based on analysis of alternatives using the Engineering Evaluation and Cost Analysis (EE/CA) process.



Blackbird Mine Remediation Salmon, Idaho

Client:

Blackbird Mine Group

Contacts:

Dan Myers, Noranda
Mining, Inc.,
Tel: (208) 756-8688

Dave Jackson, Coordinator
for Alumet
Tel: (303) 838-0700

Period of Performance:

1994 to present

Contract Amount:

\$13 Million to date

Key Personnel:

Mike Brown
Doug Dunster
Dave Findley
Josh Ford
Lee Holder, P.E.
Joe Kennedy
John Liu
Richard Luark, P.E..
Dave O'Malley
Douglas Morell, Ph.D.
Cheryl Ross
Frank Shuri, P.E.
Tom Stapp
Hank Swift, P.E.
Stella Swanson, Ph.D.
Cathy Smith, P.E.
Lisa Vaughn
Rens Verburg, Ph.D.

Implementation of Early Actions was complicated by site conditions included mountainous terrain at elevations of 6000 to 7800 feet, and short construction seasons due to winter conditions and heavy snowpack. The Early Actions have resulted in greater than 95% reduction in copper concentrations in Panther Creek. In addition, tailings deposits containing arsenic above human health criteria have been removed from several miles of stream banks and public and private property alongside Blackbird and Panther Creeks. The work included:

- Developed a model for design rainfall (500 yr) and snowmelt (100 yr) events which simulated the storage and subsequent treatment of potentially contaminated water from multiple sources. Storage was provided in the two reservoirs (7100 Dam and 7000 Dam) and in the underground mine prior to treatment. The model was used to optimize diversion and storage facilities and water treatment plant capacity.
- Diversion of clean water above all waste rock dumps to reduce amount of water that required storage and treatment.
- Collection of contaminated surface water and groundwater below waste dumps for treatment.
- Expansion and automation of an existing water treatment plant from 400 gpm to 1,000 gpm.
- Removal of selected waste rock dump and tailings deposits.
- Construction of a cover caps for selected waste rock piles.
- Construction of two large dams (95 ft. high) for collection and storage of contaminated water prior to treatment.
- Construction of two medium size sediment control dams 30 feet high.
- Construction of a 1,400 ft adit to connect the northern basin to the mine.
- A new pump station for the transfer of contaminated springs and seeps.
- Construction of a drainage system in the pit to connect to the underground mine.
- Construction of concrete channel for Meadow Creek to prevent contact with waste rock.
- Construction of off-channel rearing habitat and restoration following tailings removal activities.
- Construction of 2 large Drop Structures for conveyance of stormwater, one was a 2,000 ft long 18 inch HDPE pipe and one was 1,900 ft long with a vertical drop of 460 ft.
- West Meadow Creek Conveyance pipelines; 18 to 30 inch dia., 2300 ft long pipeline.
- Water Treatment Plant Pumpback Pipeline; this 6 inch diameter, 4,000 ft long, pipeline conveys high pressure (300 psi) contaminated water.

Remedial Investigation

The RI was conducted concurrently with the Early Actions to identify residual source areas of metals loading and to impacts to environmental media for the



Blackbird Mine Remediation Salmon, Idaho

Client:

Blackbird Mine Group

Contacts:

Dan Myers, Noranda
Mining, Inc.,
Tel: (208) 756-8688

Dave Jackson, Coordinator
for Alumet
Tel: (303) 838-0700

Period of Performance:
1994 to present

Contract Amount:
\$13 Million to date

Key Personnel:

Mike Brown
Doug Dunster
Dave Findley
Josh Ford
Lee Holder, P.E.
Joe Kennedy
John Liu
Richard Luark, P.E..
Dave O'Malley
Douglas Morell, Ph.D.
Cheryl Ross
Frank Shuri, P.E.
Tom Stapp
Hank Swift, P.E.
Stella Swanson, Ph.D.
Cathy Smith, P.E.
Lisa Vaughn
Rens Verburg, Ph.D.

Human Health and Ecological Risk Assessments and to provide information needed to evaluate alternatives in the FS. Work included:

- Several years of stream gauging to determine snowmelt runoff hydrographs and relationship to metals loading and water quality.
- Extensive synoptic surface water sampling combined with flow measurements to determine sources of metals loading.
- Sampling of sediments, surface soils, groundwater, and vegetation.
- Macroinvertebrate studies and multi-metric evaluations of population data to determine biotic indices at impacted and reference locations.
- Electrofishing to determine the recovery and health of fish populations following implementation of Early Actions.

Terrestrial Ecological Risk Assessment (ERA)

Golder recognized that due to the elevated metals present at this mine site, the traditional "bottom up" approach used in Ecological Risk Assessments was likely to show environmental hazard indices (EHIs) that were unacceptable, even though risks at the population level may be insignificant. Therefore, Golder incorporated an innovative "top down" approach in the ERA starting from the planning stage. This approach entailed evaluation of population and community level of effects to ecological receptors of concern. The risk characterization was based on the overall "weight of evidence" using ecological land classification mapping, assessment of habitat suitability, food resource quality, an evaluation of sizes of home ranges and resulting numbers of individuals potentially impacted due to site contaminants. Results of the ERA indicated that no additional remedial actions were needed to address risk to terrestrial ecological receptors.

Feasibility Study

A range of alternatives was evaluated in the FS for final remedy to address residual sources of metals loading. As part of the analysis, detailed evaluations were conducted of the effectiveness of each of the alternatives at meeting water quality goals in area streams. The FS was approved by EPA in 2002 and a Record of Decision (ROD) was issued by EPA in February 2003. The selected action includes additional surface water and groundwater collection and treatment from sources of metals loading, selective removal of overbank deposits and in-stream sediments, natural recovery for most in-stream sediments, capping the tailings impoundment, continued operation of the wastewater treatment plant, and institutional controls.

Remedial Design/Implementation

Remedial Design and Implementation has been occurring concurrently with Consent Decree negotiation to expedite achievement of water quality goals and reintroduction of Chinook Salmon to Panther Creek.



GE Apparatus Service Shop RI/FS Spokane, Washington

Client:
General Electric

Contact:
Christopher Allen
Tel: (518) 385-0623

Key Elements

- PCB Soil and Groundwater Impacts
- Renegotiated CAP
- 40% Reduction in Remediation Costs

Key Personnel:

Doug Morell, Ph.D.
Lee Holder, P.E., FS Leader
Ted Norton, RI
Paul VanMiddlesworth
Bryony Stasney, L.G., L.Hy.

Golder performed site investigation work at a former transformer service shop in Spokane, Washington, where site contaminants were primarily PCBs. The site was remediated pursuant to both CERCLA and MTCA, with the Washington State Department of Ecology being the lead agency. Because of the PCBs, TSCA regulations were also a consideration.

Major project features include:

- Washington State Department of Ecology approval of all project investigation plans, including health and safety, sampling and analysis, and quality assurance project plans.
- Performed on-site analysis for PCBs, tri- and tetra-chloro benzenes, and volatile organic compounds, using project-specific QA/QC procedures.
- Hydrogeological investigations included drilling angled boreholes and vertical holes of varying depths to determine lateral and vertical extent of affected groundwater in relation to the Spokane Rathdrum Prairie sole source aquifer.
- Executed stringent health and safety procedures during all phases.
- Determined extent of impacted soil and water.
- Prepared RI and FS Reports.

Golder prepared the groundwater portion of the RI and associated risk assessment. In the Feasibility Study, Golder developed the approach and technical basis for the groundwater remedy accepted by the Washington State Department of Ecology and the US EPA, which was "no action" with monitoring.

In situ vitrification (ISV) was selected as the remedy for soils in the original FS conducted by another consultant. GE had signed a Consent Decree and Cleanup Action Plan (CAP) with Ecology to conduct ISV. The bid cost of ISV was much more than anticipated in the FS, and Golder supported GE in an attempt to renegotiate the CAP. Subsequently, Golder conducted a forensic evaluation of ISV and prepared a Supplemental FS that documented technical problems associated with ISV. Golder proposed a modified remedy that would accomplish remedial action objectives (PCB destruction) more reliably and at less cost. Golder's modified remedy was accepted by Ecology and was mended to the Consent Decree and CAP, which saved General Electric over three (3) million dollars.

Compliance monitoring for the site is ongoing.



Pasco Bulk Fuel Terminal State Superfund Site - Pasco, Washington

Client Contacts:

Crowley Marine Services
Stephen Wilson
Tel: (206) 332-8033

Port of Pasco
Randy Hayden
Tel: (509) 547-3378

Key Elements

- Remedial Design
- Remedial Action
- O&M
- Bulk Fuel Tank Farm Demolition
- Large Scale IAS & SVE
- Agency Negotiations

Key Personnel:

Lee Holder, P.E.
Doug Morell, Ph.D., L.G., L.Hy.
Paul VanMiddlesworth
Doug Dunster

Golder is currently performing soil and groundwater remediation for this large brownfields site in Pasco, Washington. The clients are Crowley Marine Services, Inc. and the Port of Pasco, cooperating as the Pasco Bulk Fuel Terminals Site Coordinating Group. WDOE's Spokane office has the lead for this MTCA site. Contaminants throughout the site are benzene, petroleum hydrocarbons (TPH), non-aqueous phase liquid (NAPL), and polynuclear aromatic hydrocarbons (PAHs). Part of the site also has chlorinated volatile organic compounds (VOCs).

Golder was retained after completion of the RI/FS and remedy selection to comment on the draft Cleanup Action Plan (CAP). In reviewing the site data and the proposed remedy, Golder discovered that the proposed remedial technologies would not meet all of the proposed cleanup levels. Golder then renegotiated the cleanup levels, using WDOE's Interim TPH Policy, so that the proposed remedy could achieve the cleanup levels.

Golder also negotiated a revised, flexible remedy that allows using an innovative "adaptive management" approach to remedial design/remedial action (RD/RA). In general, Golder's adaptive management approach implements the remedy in a step-wise manner. Thus, results of the initial phases of remedial action have been used to optimize subsequent RD/RA.

Demolition of the Main Tank Farm has been successfully completed. Golder prepared the demolition bid package, conducted bidding, and served as Owner's Representative for the work.

After the Cleanup Action Plan (CAP) has been finalized, Golder prepared the remedial action plans for the site, including the Engineering Design Report and Compliance Monitoring Plan. Golder then prepared the detailed design of the remediation systems, which has been approved by the regulators. Golder installed the treatment systems and is currently performing the operation, maintenance, and monitoring for the site.

Treatment consists of in-situ air sparging (IAS) and soil vapor extraction (SVE), with limited pump-and-treat.





White King/Lucky Lass Mines Superfund Site Lakeview, Oregon

Client:

Tronox Incorporated
Western Nuclear, Inc.
Fremont Lumber Company

Key Elements:

Ecological Risk Assessment
Remedial Design
Construction Management
Groundwater Monitoring

Key Personal:

Lee Holder, P.E.
Frank Shuri, P.E.

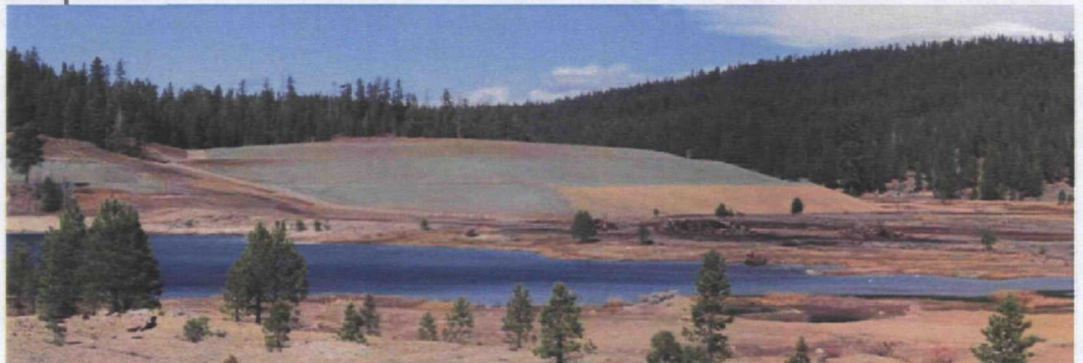
This CERCLA site consists of two former uranium mines in south-central Oregon. Constituents of concern include radioisotopes (primarily uranium and radium) and arsenic. Golder was retained after completion of the RI/FS to provide (1) design and construction management for the remedy, and (2) biological studies related to water and sediment quality. Golder first prepared workplans which were approved by the agencies.

The lead agency is the U.S. EPA (Region 10 office). Other agencies involved are the U.S. Forest Service, the Oregon Department of Environmental Quality, and the Oregon Department of Energy.

Golder prepared the remedial design of the remedy, which included consolidating mining overburden stockpiles and capping the combined stockpile. As part of this effort, Golder performed pre-design investigations in 2004 to identify local cap materials and to identify "off-pile" mine wastes to be removed to the combined stockpile. The remedy included restoration of the creek to its natural channel and wetlands development.

The ROD identified unresolved concerns over potential impacts to stream sediments and bioaccumulation of metals. Golder performed field tests of bioaccumulation using mussels, and evaluated appropriate aquatic biological habitat goals. Based on the results of these biological studies, EPA accepted Golder's finding that no remediation was necessary for the pond or creek.

Golder provided construction management (CM) and construction quality assurance (CQA) in 2004 for initial site work and for construction of the remedy begun in 2005 and completed in 2006. More than 600,000 cubic yards of contaminated soil was moved during the work.





Pend Oreille Mine RI/FS Pend Oreille County, Washington

Client:

Teck Cominco American
Incorporated

Contact:

David Godlewski
Tel: (509) 892-2584

Key Elements:

- MTCA, RI/FS
- Metals
- Tailings Impoundment
Stability Analysis
- Human Ecological Risk
Assessment

Key Personnel:

Doug Morell, Ph.D., L.G., L.Hy.
Paul VanMiddlesworth
Bryony Stasney, L.G., L.Hy.
Mike Brown, P.E.

Golder is performing a RI/FS for Teck Cominco American Incorporated to recommend the optimal remedial action that satisfies the Washington State Model Toxics Control Act (MTCA) and provides available land for acceptable use to the area and community. The Spokane office of the Washington State Department of Ecology

(Ecology) is the lead oversight agency on the project. A Public Participation plan is being implemented using a community outreach to inform and educate the public at the important stages of the project and to solicit input from the host community, particularly on the future land use for the facilities.



TDF-1 and TDF-2 are hundreds of feet in elevation above, but only about 600 feet horizontally from the Pend Oreille River. Golder is evaluating the potential for mass failure of the impoundments from seismic events. This evaluation is important for evaluating necessary remedial actions, the long-term stability of the impoundments and protection of the River.

In order to satisfy MTCA, the remedial actions must reduce risk to human health and the environment to acceptable levels. Currently, the only operable pathway for human health risks appears to be direct contact/incidental ingestion with tailings in TDF-1 and TDF-2. In review of the available reports, data indicate there may be elevated metals (lead and zinc) in the sediments in the creek draining the tailings impoundments and in the wetlands on TDF-1. The surface water quality is being tested for potential exceedence of hardness adjusted ambient water quality criteria for dissolved metals. We will be conducting a tiered approach to evaluating terrestrial and aquatic ecologic risks. The first tier is to score the site to determine if it qualifies for an exemption to conducting an ecologic risk evaluation and the second tier is a comparison of soil concentrations to screening levels. Because existing site information indicates the site will not pass the requirements for an exemption and the tailings concentrations are above screening levels, a detailed site specific terrestrial risk assessment will be conducted. Risks to terrestrial ecology potentially may exist from direct contact to tailings, through ingestion of vegetation, or through ingestion of insects and borrowing animals. Although browsing or grazing wildlife has the potential to be exposed to metals from the tailings impoundments through plant uptake, much research has been done at similar mine sites that indicate plant uptake may be minimal when the soil is alkaline.



Water Treatment at the Success Mine and Mill, Wallace, ID.

Clients:

Idaho Department of
Environmental Quality

Terragraphics Environmental
Engineering

Contacts:

Rob Hanson,
Idaho Department of
Environmental Quality,
Boise, ID
Tel: (208) 373-0502

Luke Russell,
Idaho Department of
Environmental Quality,
Kellogg, ID
Tel: (208) 783-5781

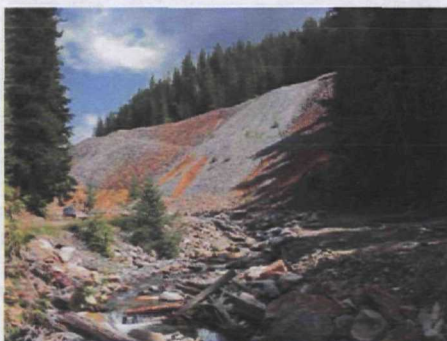
Jerry Lee,
Terragraphics,
Moscow, ID
Tel: (208) 882-7858

Key Personal:

Doug Morell, Ph.D., L.G., L.Hy.
Bryony Stasney, L.G., L.Hy.
Hank Swift, P.E.
Lee Holder, P.E.

The Success Mine and Mill site, a 200 to 350 thousand cubic yard tailings pile, contributes significant cadmium, lead and zinc loading to the South Fork of the Coeur d'Alene River. Between 2000 and 2002, Golder assisted the Silver Valley Natural Resource Trustees with identification of a semi-passive treatment system, pre-design investigation, design and bid assistance, construction oversight and effectiveness monitoring. Since May 2002, operations, maintenance and monitoring of the site has been the responsibility of the Idaho Department of Environmental Quality (DEQ).

The overall concept of the semi-passive system is: 1) to intercept impacted, shallow alluvial groundwater before it discharges to the East Fork of Ninemile Creek (a tributary of the South Fork Coeur d'Alene River); and, 2) to reduce the concentrations of cadmium, lead and zinc within the intercepted groundwater prior to discharging the water into the creek. A 1,400-foot grout cutoff wall and hydraulic drain system was constructed between the tailings pile and the creek. A groundwater treatment vault was installed at the downgradient end of the wall. The groundwater is directed to a treatment vault comprising two 50- by 6- by 13-foot high cells containing fishbone apatite. Fishbone apatite was selected from a number of media types tested at the bench scale by the Idaho DEQ.



Golder has provided effective monitoring services at the site from January 2001 to date. Services have included:

- Preparation of an effectiveness monitoring plan with review from EPA, USGS and IDEQ;
- Monthly monitoring of cadmium, lead and zinc at the vault inflow and outflows;
- Quarterly monitoring of phosphorus (total phosphorus, total dissolved phosphorus and dissolved orthophosphate) and nitrogen (ammonia, nitrite, nitrate and TKN) within the creek upstream and downstream of the site; and,
- Quarterly monitoring of *E. coli* and *Enterococci* within the creek downstream of the site.

To date, the fishbone apatite treatment media has reduced cadmium, lead and zinc concentrations in treated groundwater by over 95%. Ongoing work at the site is focusing on the potential impacts of phosphorus and nitrogen release on the primary productivity of the creek with the objective of assessing if this nutrient release will be bound within the upper Coeur d'Alene basin or if the nutrients have the potential to travel through the surface water system and ultimately reach Coeur d'Alene Lake.



Facility Investigation and Corrective Measures Study Anacortes, Washington

Client:

Tonkon Torp, LLP

Key Elements:

RCRA Facility
Investigation/Corrective
Measures Study

Deep Well Injection

Assessment of Potential
Discharges to marine Estuary

Remedial Design

EPA Negotiations

Key Personal:

Lee Holder, P.E.
Frank Shuri, P.E.
Gary Zimmerman
Doug Dunster
Douglas Morell, PhD., L.G., L.Hy.

Golder Associates Inc. performed an RCRA Facility Investigation and Corrective Measures Study (RFI/CMS) at this site located at March Point near Anacortes, Washington. Work is being conducted pursuant to a Consent Order with EPA. The facility formerly manufactured phenols and cresols from petroleum refinery feedstock. Historic waste management practices included use of surface impoundments and underground injection wells that resulted in contamination of soil and groundwater. Golder conducted hydrogeologic investigations, including installation of nested multiple depth monitoring wells and evaluated the influence of tidal fluctuations on groundwater and contaminant movement. Site maps were prepared using photogrammetric mapping with 1-foot horizontal contouring.

The primary concern is the potential to impact offsite residential supply wells and/or discharges to Padilla Bay. Investigations to date by Golder have indicated that the impacted groundwater has not migrated to offsite receptors. Additional investigations have been proposed and are pending review and approval by EPA. Golder has also designed an onsite stormwater treatment system. Natural attenuation will be evaluated as a remedial alternative. Golder also assisted in finalizing RCRA Closure Plans and obtained approval of final closure from the Department of Ecology for some waste management units at the site.





Dad's Auto Wrecking Remedial Investigation Ponderay, Idaho

Client:

Idaho DEQ
Coeur d'Alene, ID
Tel: (208) 769-1422

Key Elements:

- Environmental Assessment
- Remedial Investigation
- Corrective Action Measures

Key Personnel:

Tim Martin, P.E.
Paul VanMiddlesworth

Golder was retained by Idaho Department of Environmental Quality to assess the nature and extent of hazardous substances and petroleum product releases from a former car crushing operation located at Dad's Auto Wrecking Yard in Ponderay, Idaho. The scope of this investigation concentrated on a target area proximal to the former portable car crusher unit with the objective of collecting sufficient surface and subsurface soil and groundwater samples to characterize any release(s) to the environment. Based on the former car crushing activities, potential contaminants of concern included a full range of petroleum hydrocarbon products associated with motor vehicles (gasoline through heavy oil ranges), lead from leaded gasoline as well as scrapped battery plates, and mercury from scrapped mercury switches.

Golder determined that site geologic conditions indicated that the very fine-grained texture of the subsurface soils had prevented the vertical migration of contaminants released during the car crushing activities, evidenced by the lack of contaminants found below the upper 2 feet of impacted soils. Near-surface soil impacts were found to be constrained to the immediate vicinity of localized surface spills from drums containing mixed oily-waste from the car crushing activities and the mobile fluid receptacle used during car crushing activities at the Site. Furthermore, groundwater analytical results indicated that no groundwater impacts had occurred as a result of the car crushing activities on the site.



Golder's recommendations included the removal of the top 2-feet of soil in the areas of petroleum impacts found in the immediate vicinity of the oily-waste drums (approximately 20 cubic yards), as well as the removal of the top 0.5-feet of soil across the entire target area (approximately 30-cubic yards). Additionally, Golder recommended removing and disposing of 15 drums containing mixed oily-waste fluids in the target area of the Site.



Dock-N-Shop Site Remediation Priest River, Idaho

Client:

JLZ Enterprises
Sagle, ID
Tel: (208) 610-8218

Key Elements:

- LUST Site Investigation
- UST Removal and Closure
- Remedial Investigation
- Corrective Action Plan

Key Personnel:

Tim Martin, P.E.
Hank Swift, P.E.
Paul VanMiddlesworth

Golder was retained by JLZ Enterprises to determine the status of an IDEQ Ordered cleanup and remediation of a leaking underground storage tank (LUST) on a commercial property located adjacent to the Pend Oreille River in Priest River, Idaho. Golder first examined the current groundwater and soil treatment systems consisting of air sparging wells, soil vapor extraction system, and an on-site air stripper system previously constructed on the site and determined them to be improperly constructed and functioning inefficiently to effectively remediate site hydrocarbon impacts within a reasonable time frame allowed by state and federal regulators. Next, Golder presented a variety of cost-effective remediation methods to clean up the petroleum-impacted soils at the Site and mitigate groundwater impacts to the Pend Oreille River waters in order to protect human health and the environment and bring closure to site remediation.

Based on the levels of petroleum hydrocarbon components exceeding Site-Specific Target Levels (SSTLs) determined for the site through Idaho DEQ Risk-Based Cleanup Guidance, Golder determined that excavation and off-site disposal of the petroleum contaminated soils would be the most cost-effective remedy for the site. Golder prepared a site work plan for UST closure, geometry and approach for soil excavation, off-site disposal of petroleum contaminated soils, collection and analysis of soil confirmation samples, and post-remediation groundwater monitoring activities that were approved by the client and Idaho DEQ.



Golder's recommendations and corrective actions allowed for the timely removal of residual petroleum sources, closure of the two remaining USTs on the site, closure of site remediation activities to Residential Cleanup Levels, as well as reduction of site remediation costs by over \$800,000.



Dudley Riverbank Stabilization Structures Cataldo, Idaho

Client:

Silver Valley Natural
Resource Trustees

Contacts:

Chuck Moss
Executive Office of the
Governor,
State of Idaho, Boise, ID
(208) 334-3645

Key Personnel:

- Doug Morell, Ph.D
- Hank Swift, P.E.
- Bryony Stasney, L.Hy.

Golder Associates Inc. (Golder) assisted the Silver Valley Natural Resource Trustees (comprised of representatives from Idaho State, Shoshone County, several mining companies, the Coeur d'Alene Tribe, BLM, EPA and citizens) to restore the South Fork Coeur d'Alene River and its tributaries for aquatic and riparian life and to reduce human exposure to residual metals in soil and surface water resulting from previous mining practices. Golder provided engineering and scientific services for several voluntary action projects under CERCLA with EPA oversight between 1996 and 2002. The Dudley Riverbank stabilization pilot project is one of these actions.

The purpose of the Dudley pilot project was to evaluate the effectiveness of using riprap armor rock berms to reduce erosion and subsequent bank collapse of banks along the lower Coeur d'Alene River caused by undercutting from boat wakes. Bank collapse along reaches of the Coeur d'Alene River where mine tailings are present may contribute to loading of heavy metals to the river and ultimately to Coeur d'Alene Lake.

Golder designed and permitted two 750-foot long in-stream rock structures at Dudley to stabilize bank erosion of tailings impacted soils to the river. The structures were placed in late 1999 between the main river channel and the eroding riverbank to allow long-term formation of stable wetland ecosystems at the toe of the bank. The rock was placed using a tracked excavator stationed on a small barge. The barge was moved and positioned using a small tugboat. The objective was to provide permanent bank stabilization without adversely affecting river flow or fish habitat.

Subsequent monitoring in 2000 and 2001 indicated that very little bank erosion had occurred and that vegetation had started to develop between the toe of the bank and the rock berm structures.



Coeur d'Alene Riverbank Stabilization Structure at Dudley Landing
(January 2001)



Del Monte Corporation RI/FS Oahu, Hawaii

Client:

Del Monte Fresh Produce,
Inc.

Oahu, Hawaii

Contact:

Eduardo Littleton

Tel: (808) 621-1220

Period of Performance:

1996 - Ongoing

Contract Amount:

>\$1,900,000

Key Project Elements:

- Hydrologic characterization
- Fractured Bedrock Aquifer
- Basalt Geology
- Groundwater monitoring Plans
- Groundwater Monitoring

Key Personnel:

Doug Morell, Ph.D.

Doug Dunster

Gary Zimmerman

Lee Holder, P.E.

As a result of a spill of agricultural chemicals, EPA placed the Del Monte Corporation (Oahu Plantation) Superfund Site on the National Priorities List (NPL) in December 1994. Golder prepared the CERCLA Remedial Investigation and Feasibility Study (RI/FS) for this site, located within a 6,000 acre pineapple plantation on the island of Oahu. Based on the FS, a Record of Decision (ROD) was issued by EPA specifying the remedy. Golder then performed the remedial design, and is assisting in construction, startup and performance evaluation of the remediation treatment systems.

The RI investigated the nature and extent of ethylene dibromide (EDB) and 1,2-dibromo-3-chloropropane (DBCP) impacts to the basal aquifer beneath the site. The basal aquifer occurs at a depth of approximately 850 ft below ground surface and is part of the Pearl Harbor Basal Aquifer system, a large and highly productive regional groundwater resource which serves as the island's primary potable and agricultural water supply. Investigative activities at the site focused on defining the source of the EDB/DBCP impacts to the basal aquifer, and on determining whether the Kunia Well's annulus provided a conduit for direct communication between a highly impacted, shallow, perched aquifer and the deeper basal aquifer. Vertical chemical profiling of the Kunia Well water column, downhole geophysics, analyses of historical analytical data and perched aquifer sampling indicated that, while the Kunia Well may have served as a conduit previously, the current contaminant source to the basal aquifer is area wide infiltration from the perched aquifer and from fumigant application to agricultural fields. The perched aquifer is comprised of saprolite on top of the basalt bedrock.

A key obstacle to conducting the RI was the collection of sufficient basal groundwater data given the great depth to groundwater and resulting high drilling costs (~\$250,000/well). In part due to this cost consideration, basal well drilling was limited to one basal well during each investigative phase, and the nature and extent of basal EDB and DBCP impacts were determined through predictive fate and predictive analyses during each phase for refining the hydrogeologic conceptual model. Golder designed and overviewed the installation of each basal well and most of the perched aquifer wells. Modeling was conducted initially using the US Air Force's BIOSCREEN spreadsheet flow. BIOSCREEN was modified to allow incorporation of probabilistic inputs based on site and regional data, and the consideration of uncertainty into the modeling exercise. Recently, Golder developed a comprehensive three-dimensional flow and transport model using the USGS MODFLOW code for the regional basal aquifer including basalt layers. The MODFLOW model is used for analyzing hydraulic pump tests and determining the capture zone created from basal aquifer extraction at 750 gpm. The results indicated that, despite limited spatial data from wells and model input uncertainty, there was a high likelihood no existing downgradient large-capacity municipal drinking water supplies were threatened.

The FS looked at a range of alternatives for both a perched aquifer system and the basal aquifer. For the perched aquifer, the selected remedy involves a combination of soil vapor extraction (SVE) in combination with groundwater extraction. The highly-impacted, but low transmissive perched groundwater is treated in an on-site phytoremediation system. The remedy for the highly transmissive, but low-impacted basal aquifer involves groundwater extraction and treatment for the source area, and monitored natural attenuation (MNA) for the downgradient area.



Del Monte Corporation RI/FS Oahu, Hawaii

Golder designed a 1000-gpm groundwater treatment system for basal aquifer source control, which has been approved by the EPA. Golder has assisted in construction and startup of this system. Golder performed a pilot test for SVE treatment of the perched aquifer, and is currently designing the full-scale SVE system.

Golder is currently finishing remedial actions and conducting compliance monitoring at the site. The perched aquifer groundwater and phytoremediation system has been operational since 2001, which has significantly dewatered the perched aquifer. The perched aquifer SVE system is being designed for installation and operation to remove residues from the dewatered perched matrix soils. The basal aquifer groundwater extraction and treatment system has been installed and is fully operational since September 2005. The capture zone is being continually monitored with pressure transducers. A Work Plan is currently being approved by Region IX EPA for evaluating the contribution of fumigants to the basal aquifer from area-wide normal application to agricultural fields.

Client:
Landsburg PLP Group

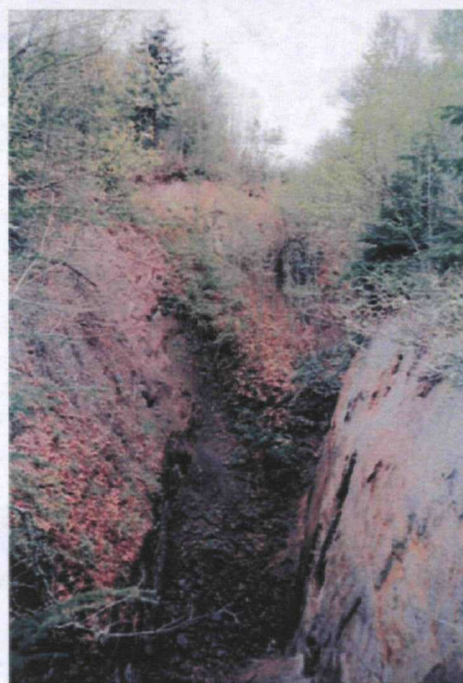
Contact:
Bill Kombol
Tel: (360) 432-4700

Key Elements

- Remedial Investigation
- Feasibility Study
- CAP Negotiations
- Large PLP Group
- Trench Capping

Key Personnel:
Douglas Morell, Ph.D., R.Hg.
Frank Shuri, P.E.
Gary Zimmerman

Golder Associates was retained by the Landsburg Potentially Liable Party (PLP) Group to conduct an RI/FS for the Landsburg Mine site, a Washington State Priority Listed site being investigated under MTCA. The site consists of an abandoned underground coal mine that was mined until approximately 1975. As a result of underground mining of the near vertical coal seam to depths up to 750 ft, a subsidence trench developed on the land surface above the mine workings. This trench, some 60 ft deep, 100 ft wide and 3/4 mile long, was used for the disposal of various industrial waste materials, construction materials, and land-clearing debris.



Landsburg Mine Subsidence Trench

An estimated 4,500 drums and about 200,000 gallons of oily waste water and sludges were disposed into the trench. The RI focused on pathways of chemicals potentially exiting the mine, rather than on characterizing the contents of the mine itself. Field activities included the installation of groundwater monitoring wells at points of expected mine groundwater discharge, four quarters of groundwater sampling at area monitoring, private and public supply wells, geophysical surveys down the centerline of the trench to identify areas of potential buried waste, air monitoring, and surface soil sampling. The major conclusion of the RI was that chemicals are not exiting the mine but are confined to those portions of the trench which were used for waste disposal.

As a result, the FS, which consisted of evaluations of potential remedial alternatives for site cleanup, focused on capping alternatives rather than excavation. Golder assisted the Department of Ecology in the presentation of the RI/FS results to the public, and in the preparation of the Cleanup Action Plan documenting selection of the site remedy. Golder is currently negotiating the Cleanup Action Plan (CAP) on behalf of the PLP Group. The CAP is on the final draft and the preferred alternative consists of backfilling the trench to grade, capping with a low-permeability soil cover, and long-term groundwater monitoring to confirm that waste materials do not exit the mine in the future, which was accepted by the Washington State Department of Ecology.



Hydrogeologic Evaluations

Moses Lake, Washington

Client:

City of Moses Lake, WA

Contact:

Gerry McFaul
Tel: (509) 766-9217

Key Elements:

- MTCA, RI/FS
- Petroleum Hydrocarbon Remediation
- Confirmatory Monitoring Complete
- Ecology Eastern Regional Office

Key Personnel

Doug Morell, Ph.D., L.G., L.Hy.
Lee Holder, P.E.
Ted Norton
Paul VanMiddlesworth
Bryony Stasney, L.G., L.Hy.

Golder Associates has been retained by the City of Moses Lake since 1989 for various projects to perform hydrogeologic investigations related to various water supply and wastewater functions. The studies have focused on various aspects of the shallow alluvial and deep basalt aquifer systems present in the vicinity. Golder's work has included:

- A baseline hydrogeologic analysis of the basalt aquifer system;
- An initial assessment of the source of trichloroethylene (TCE) detected in three of the City's high-capacity production wells located adjacent to Larson Air Force Base;
- A remedial design recommendation and field oversight of well modifications to eliminate TCE in two of the City's wells;
- Siting and installation of a new 1,300 foot deep 16-inch diameter well installed in the Grande Ronde basalt;
- Wellhead protection area delineation for two of the City's wells;
- Hydrogeologic assessment of the Sand Dunes Wastewater Treatment Plant; and,
- Characterization and remediation of petroleum hydrocarbon in soils and shallow groundwater at the City's Maintenance Facility.

Through a combination of field studies and integration of existing data, Golder has provided technical assessments of local and regional groundwater flow systems, local and regional water quality, well completions, groundwater monitoring requirements, shallow/deep aquifer interactions, and groundwater surface water interactions.



Drilling Monitoring Wells at the Moses Lake Sand Dunes Wastewater Treatment Plant



Water Quality and Loading Analyses, Coeur d'Alene River, Idaho

Client:

Silver Valley Natural
Resource Trustees

Contacts:

Chuck Moss
Executive Office of the
Governor,
State of Idaho, Boise, ID
(208) 334-3645

Key Personnel:

Hank Swift, P.E.
Bryony Stasney, L.Hy
Doug Morell, Pd.D., L.G., L.Hy
Frank Shui, P.E.

The Silver Valley Natural Resource Trustees (SVNRT) was formed in 1986 to administer a \$4.5 Million settlement between the State of Idaho and mining companies within Northern Idaho's Silver Valley. The SVNRT comprised representatives of the State of Idaho, Shoshone County, Asarco, Sunshine Mining and Refining and citizens of the Silver Valley. The SVNRT were assisted by a technical team of federal (EPA), state (ID Fish and Game and Idaho Department of Environmental Quality), tribal (Coeur d'Alene Tribe), private (Hecla Mining Company) and citizen stakeholders. The objective of the SVNRT and their technical team was to improve the water quality and fish habitat of the South Fork of the Coeur d'Alene River. A number of projects including water quality sampling and loading studies, floodplain tailings removals and restoration, river bank stabilization and construction of repositories were completed between 1996 and 2002 to meet this objective. Golder provided environmental engineering and scientific consulting services to the SVNRT on these projects between 1997 and 2002.

The SVNRT water quality and loading study involved proportioned surface water sampling and discharge measurements along a 7-mile reach of the South Fork of the Coeur d'Alene River and 12-mile reach of Coeur d'Alene River in August and September 1998. The study objective was to identify the location and magnitude of non-point source loading of metals to the river.



Tailings Impacted Sediments in banks of the Coeur d'Alene River

The components of the study included: workplan development; reconnaissance sampling and screening; selection of seven river cross sections; discharge proportioned water quality sampling for chemical and physical parameters; water quality data evaluation; and, metals loading analyses.

The project results indicated that no significant inflows of impacted groundwater nor metals rich sediment from river bank erosion could be identified during low flow along this 17 mile river reach. These results were used to prioritize areas to be considered by the SVNRT for remedial action and to develop strategies for remedial action implementation and habitat enhancement projects.



Pack River Stream Channel Assessment Idaho

Client:

Avista Utilities
Noxon, Montana

Contact:

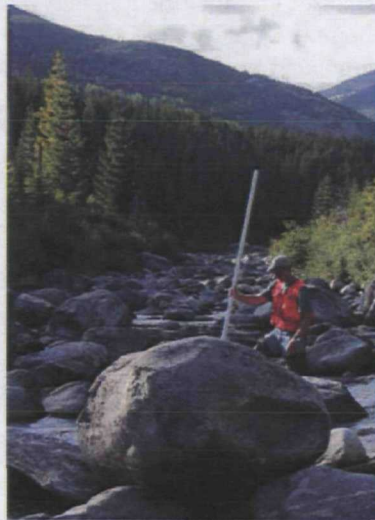
Joe Dossantos
Aquatic Program Leader
Phone: (406) 847-2729
Fax: (406) 847-2265

Key Personal:

Donna DeFrancesco

Located in northern Idaho, the Pack River is the second largest tributary to Lake Pend Oreille and contains important spawning and rearing habitat for bull trout. Westslope cutthroat, a species of concern, are also present in the drainage. The lower Pack River however, is water quality limited (303(d) listed) due to excess sediment and nutrients. The Pack

River also contributes the highest per-acre loading of nitrates and phosphorous to Lake Pend Oreille.



In order to develop a framework for a Pack River Watershed Management Plan and TMDL, Golder Associates completed a stream inventory of 40 miles of the Pack River.

A Rosgen Level II approach was utilized to characterize basin geomorphology and classify stream type - measuring gradient, cross-section, flood-prone zone, entrenchment, sinuosity, and streambed particle size distribution.

The Forest Service R1/R4 fish habitat inventory was utilized to characterize in-stream fish habitat, measuring individual habitat unit areas, and quantity and quality of large woody debris. To characterize riparian habitat, the Forest Service riparian greenline survey methodology was utilized.



The Pack River stream characterization provides Avista and the Pack River Technical Advisory Committee (TAC) with:

- 1) An inventory of existing conditions,
- 2) An identification of problem areas,
- 3) An evaluation of functions of resources,
- 4) And recommendations for management and restoration of ecological functions, where needed.

Client:

Watershed Consulting
Whitefish, MT

Contact:

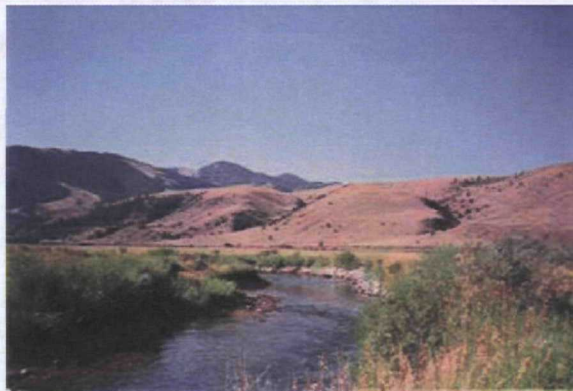
Amy Chadwick
Water Quality Specialist
Phone: (406) 852-3565

Key Personal:

Donna DeFrancesco

The Ruby River watershed, located in southwestern Montana, had 27 stream segments on 26 waterbodies identified as impaired or threatened on the state's 303(d) list of water quality limited streams.

Probable causes of impairment in the watershed include sediment, metals, thermal modification, and nutrients. Total Maximum Daily Loads (TMDLs) are required for all listed waterbodies unless documentation and data review indicate that all beneficial uses of the waterbody are fully supported.



Golder Associates was contracted as part of a team to complete a water quality data review and characterization for the Ruby River watershed as a precursor to development of the TMDLs.



Golder's services included:

- Summary of historic water quality and watershed condition
- Format and review of Access database of all known water quality data for the watershed
- Visual representation of water quality data by parameter type, agency, exceedance ranges, etc
- Development of an interactive GIS-information tool linked to an updateable Access database containing all watershed water quality information

APPENDIX B

RESUMES

Donna DeFrancesco



Education: M.S., Candidate Wildlife Biology, University of North Dakota, Grand Forks, ND
B.A., Biology, Northwestern University, Evanston, IL, 1992.

Experience:

2001 to date

Golder Associates

Washington

Senior Project Ecologist

Ms. DeFrancesco provides expertise in technical and policy areas of riparian and wetland ecology, function, management and restoration, watershed and habitat planning, instream flow and water quality. She is trained in ACOE Wetland Delineation Procedures for Routine and Comprehensive Wetland Delineations and coordinates with related Golder technical and engineering service areas to provide structural and institutional habitat solutions to client problems. Her project management and technical experience have included: large scale channel and riparian rehabilitation projects; chemical, physical and biological assessments of surface water; riparian and aquatic habitat condition assessment of streams and rivers; water quality characterizations, and instream flow assessments; as well as wetland determination, delineation and restoration.

1997-2001

University of Montana

Montana

Riparian and Wetland Research Program

Project Manager

Ms. DeFrancesco managed and performed physical and biological assessments related to the ecology, condition, management, and restoration of river and wetland systems. Planned and supervised the activities of graduate students, junior staff, seasonal staff and volunteers. Completed technical reports, project budgets, summary reports, grant proposals, designs, drawings, permits, specifications. Coordinated with funding agencies, subcontractors, local, state and federal agencies coordinated meetings, attended technical and public relations events. Presented findings at technical conferences

1995-1997

ND Game and Fish Department

North Dakota

Biologist

Responsible for implementing Northern Coteau Project, a six county private/public lands habitat restoration/enhancement program. Designed and implemented over 80 wetland restoration/creations, native grass restorations, and grazing management systems.

1992-1995

University of North Dakota

North Dakota

Responsible for a two-year field study evaluating the biological communities of newly restored wetlands. Completed a one-year field study of avian and macroinvertebrate use of highway constructed wetlands. Taught upper level Ornithology and Introductory Biology.

1991

Massachusetts Dept. of Environ. Management

Massachusetts

Island Manager

Management of visitor uses for 50-acre Island in Boston Harbor Islands State Park. Gave natural resource/history tours/workshops to over 500 visitors weekly. Planned and supervised the activities of up to 12 park volunteers.

1990

Evanston Health Department

Illinois

Biological Technician

Responsible for the water quality collection/ E. coli analysis in support of beach use at eight Lake Michigan area beaches.

PROJECT EXPERIENCE – INSTREAM FLOW ASSESSMENT

Chewuch River Habitat Conservation Plan, Chewuch Basin Council Washington

Currently completing analysis of instream flow to determine effects of flow improvements in relation to improvements in channel substrate and cover enhancements on the Chewuch River. Information will be incorporated into Chewuch River HCP as alternative management scenarios.

WRIA 45 (Wenatchee) Watershed Planning, Chelan County Washington

Completed an instream flow decision framework. The document is to be used by the Planning to develop an instream flow scope of work and to select appropriate methodologies for instream flow assessment in the Wenatchee watershed.

WRIA 11 (Nisqually) Watershed Planning, Nisqually Tribe Washington

Completed basin historical context and scope of work for implementing an instream flow assessment on the Mashel River using PHABSIM modeling approach. The information is incorporated into the Step A instream flow report completed as part of WRIA 11 Phase 2 Level 2 assessments.

WRIA 57 (Little Spokane River) Watershed Planning, Spokane County Washington

Completed an instream flow assessment of the Little Spokane River using a wetted perimeter and PHABSIM modeling approach. Responsible for field data collection of instream flow habitat parameters and discharge and velocity measurements as well as data analysis and report preparation. Also directs the development and updates of the Spokane watershed website.

WRIA 15 (Kitsap Watershed) Watershed Planning Kitsap County Washington

Supervised the completion of field data collection for the Kitsap Step C Instream Flow Assessment an assessment of hydraulic continuity for Barker and Artondale Creeks.

PROJECT EXPERIENCE – ENVIRONMENTAL PLANNING

Yakima Habitat Master Plan, City of Yakima

Washington

Developed a Habitat Master Plan for the Yakima Urban Growth Area including creating criteria for prioritization of stream habitat for acquisition and restoration, prioritized properties for protection, long term monitoring and evaluation plans, as well as recommendations for habitat improvement for existing City of Yakima properties and other associated habitat improvements. Worked with a Technical Work Group of agencies and conservation organizations to develop the plan.

Fruitvale Diversion Irrigation Consolidation, City of Yakima

Washington

Fish and habitat component of a feasibility study and alternatives analysis. Project focused on reviewing options associated with moving, maintaining, and consolidating three irrigation diversions of the Naches River used for the City of Yakima's irrigation system.

WRIA 29/30 Salmon Habitat Recovery Strategy, Klickitat County

Washington

Assisted with development of a planning document to be used by the Citizens Review Committee for prioritizing and funding salmon recovery projects within WRIAs 29/30. Document included detailed information on limiting factors for salmonid production within each of the 48 individual subbasins. Subbasin evaluation included: native fish species occurring in basin, status of those species, significant subwatersheds, factors affecting habitat condition, level of certainty, project recommendations, and effectiveness monitoring.

WRIA 14 (Kennedy/Goldsborough) Watershed Planning, Mason Co.

Washington

Completed multiple sections of Phase II Level 1 assessment for watershed planning in WRIA 14

WRIA 16 (Skokomish/Dosewallips) Watershed Planning, Mason County Washington

Completed multiple sections of Phase II Level 1 assessment for watershed planning in WRIA 14

Hatchery Genetic Management Plan, Methow Salmon Recovery Fdn.

Washington

Completion of a Hatchery Genetic Management Plan for development of acclimation ponds for steelhead production on the Twisp River.

Hatchery Genetic Management Plan, Colville Tribes

Washington

Completion of a Hatchery Genetic Management Plan for development of fish hatchery and rearing ponds on the Okanogan River for spring chinook and steelhead.

Rocky Mountain Juniper Management Plans, Turner Enterprises

Montana

Plan summarizing juniper management procedures and management alternatives for Rocky Mountain juniper (*Juniperus scopularum*) on the riparian areas of a 16,000 acre ranch.

PROJECT EXPERIENCE – HABITAT ASSESSMENTS

WRIA 62 (Pend Oreille) Watershed Planning, POCD, **Washington**
Habitat component for Phase II Level 2 Watershed Planning for WRIA 62. Summarized current and recently completed habitat projects, fish distributions, and data needs for the subbasins of the Pend Oreille Watershed.

Ahtanum Watershed Assessment, Washington Department of Ecology **Washington**
Developed an overview document describing appropriate methodologies for addressing habitat and instream flow conditions in the Ahtanum Watershed in the context of development of the Pine Hollow Reservoir. Completed a stream channel assessment of riparian, geomorphic and fish habitat of 10 miles of Ahtanum Creek, using BLM Proper Function Condition (PFC) and SSHIAP fish habitat protocols. Utilized the assessment in determining. Provided habitat improvement recommendations necessary to complement management alternatives associated with implementation of Pine Hollow Reservoir.

Pack River Stream Channel Assessment, Avista Corp. **Idaho**
Worked with Pack River Technical Advisory Committee for completion of a stream channel assessment of 40-miles of the Pack River, a tributary to Lake Pend Oreille in northern Idaho. Stream assessment involved an inventory of geomorphic features, riparian and fisheries habitat. Assessment included Rosgen Level II geomorphic methods, riparian greenline methods, and USFS R1/R4 fish habitat inventory protocols.

Ruby River Watershed Assessment, Turner Enterprises **Montana**
Project management and implementation of a two year assessment of the physical, chemical and biological characteristics of surface water of a 17 mile reach of the Ruby River and its tributaries to develop recommendations for ranch management and watershed restoration. Assessments included Rosgen Level 2 Stream Channel assessments and riparian condition inventory, hydraulic (HEC-RAS and hydrological modeling), suspended and bedload sediment analysis, temperature analysis, macroinvertebrate community sampling and habitat assessment, depth integrated surface water quality sampling for chemical characteristics and flow.

Musselshell River Assessment, Montana DEQ **Montana**
Assessment to develop recommendations for land use planning and watershed restoration targets. Assessment sampling plan and with monthly monitoring over a two-year period of chemical, physical and biological, channel stability, riparian vegetation inventory and condition, and channel erosion rates parameters of 37 miles of the Lower Musselshell River surface water.

Red Rock River Assessment, Turner Enterprises **Montana**
Project management, sampling design and implementation of an assessment of the physical, chemical and biological characteristics of surface water of a 10 mile reach of the Red Rock River. Monthly assessment included, suspended and bedload sediment analysis, temperature analysis, macroinvertebrate community sampling and habitat assessment, depth integrated surface water quality sampling for chemical characteristics and flow.

Fish Survey, Cogentrix **Washington**
Electrofishing survey of streams of Mercer Ranch to obtain fish species and presence information.

Snoqualmie River Wetted Perimeter Assessment

East King County Ground Water Association

Washington

Survey of multiple reaches on Snoqualmie River to assess fish habitat with relation to flow, water quality and wetted area. Utilized Hankin and Reeves methodology and wetted perimeter analysis. Collected general water quality characteristics including temperature, pH, conductivity.

Stream Inventories, Various clients

Montana

Conducted stream channel inventories on streams throughout Montana and Idaho Inventories included: PFC, Rosgen geomorphic analysis, R1/R4 fish habitat inventory, greenline and other riparian inventory.

PROJECT EXPERIENCE – WATER QUALITY ASSESSMENTS

Lake Coeur D'Alene Temperature Assessment, Avista Corp.

Idaho

Currently completing an assessment of temperature of nearshore habitat, rivers, and minor tributaries of Lake Coeur d'Alene. Information will be used to address implications of management scenarios for Post Falls Dam as a component of the FERC Re-licensing of dam.

WRIA 15 (Kitsap) Watershed Planning, Kitsap County

Washington

Completed the water quality component for Phase II Level 1 Watershed Planning for WRIA 15. Assessment included a compilation of existing data on beneficial uses, pollutants, 303(d) listings, TMDL developments, sources of point/nonpoint pollution and data gaps.

Ruby River TMDL Assessment, Watershed Consulting

Montana

Project management for completion of Phase I components of a water quality data review for 303(d) listed streams within the Ruby River watershed of southwestern Montana. Components included historical water quality and watershed condition summary, organization of water quality database, and visual representation through GIS of nutrient, metal, sediment, and temperature data for impaired waterbodies. Phase II components will involve completion of a TMDL for sediment and temperature for the basin.

Assessment of State Grazing Guidelines,

MT Department of Environmental Quality/Bureau of Land Management Montana

Project management for an evaluation of the effectiveness of the Montana State Grazing Guidelines for protecting surface water quality and aquatic habitat in the Medicine Lodge and Box Elder Creek watersheds of Montana. Four year project involved establishment riparian habitat inventory, Rosgen Level II geomorphic assessments and riparian condition inventories., surface water quality sampling, grazing level indicator monitoring (browse, stubble height, streambank alteration, key area grazing), macroinvertebrate habitat and community sampling, channel cross-section geometry, aquatic habitat features (fine sediment, canopy cover, percent undercut banks, etc.).

PROJECT EXPERIENCE – RIVER AND STREAM RESTORATION

Centralia Mine Stream Restoration Plan, TransAlta

Washington

Project management, riparian and fish habitat restoration designs to rehabilitate 28000 feet of Packwood, North and South Hanaford Creeks upon closure of the Centralia Mine site. Plans include preliminary design specifications, plan, representative cross-sections and profile views along with fish distribution, habitat and riparian restoration recommendations and planting plans to be included in the OSM permit for Centralia Mine.

Ruby River Restoration Plans, Turner Enterprises

Montana

Project management, channel, and riparian restoration designs to rehabilitate 17 miles of the Ruby River, Montana. Managed a multidisciplinary staff of professionals and technicians. Design development involved data collection, survey, and analysis of hydrological, geomorphological, hydraulics, and sediment. Hydrological evaluations included: flood-frequency analysis, effective discharge analysis, determination of design discharge and flow-duration curves. Geomorphological analysis included evaluation of channel and bed stability, collection and analysis of particle size distribution, determination of valley width, channel reach slopes, historic channel migration, channel geometry, channel planform and pattern, sinuosity, riffle/pool run ratios. Hydraulics analysis included use of HEC-RAS analysis of hydraulic variables for various flow events and treatment components. Treatment design components included: use of juniper revetments, root wads, grade control, brush bars, riparian revegetation using mature transplants and willow stakes, and bank overhanging revegetation.

Clark Fork River Streambank Stabilization, ARCO

Montana

Project management, development, data collection, and analysis of 23 different streambank restoration designs of eroding banks on the Upper Clark Fork River (longest Superfund site in the US). Principle author of report on the Upper Clark Fork River Streambank Stabilization Pilot Project. Hydrological evaluations included: flood-frequency analysis, effective discharge analysis, determination of design discharge and flow-duration curves. Secured permits and prepared construction drawings. Treatments included: mature willow transplants, container vegetation, willow stakes and poles, rock barbs, log barbs, coir fascines, willow/redosier dogwood fascines, rock toes double-rolled coir fabric, etc. Monitoring included over 140 permanently monumented channel cross-sections. Analysis included rates of channel migration, hydraulic variables, channel width to depth, etc.

Ruby River Bank Stabilization, Turner Enterprises

Montana

Project management of stabilization of 36,000 feet of riprap with vegetation. Responsible for design, implementation, and crew supervision in collection, preparation, and planting and of over 80,000 willow stakes. Responsible for site selection for placement, collection guidelines, and subcontractor supervision of transplanting and watering mature willow to stabilize eroding riprap.

PROJECT EXPERIENCE – WETLANDS

Delineation of Created Wetlands, Fort Knox Gold Mining Inc

Alaska

Data review, field delineation, fish habitat review and reporting over 200 acres of wetlands. Project assessed mitigation compliance of FGMI with respect to created ponds, water supply reservoir, and stream habitat enhancements developed on the Fort Knox Gold Mine in Fairbanks Alaska.

Maryhill State Park Wetland Delineation, WA Parks and Recreation

Washington

Site review, delineation and reporting of wetlands on the Maryhill State Park for impacts pertaining to planned development of a Columbia River boat launch.

Fircrest Wetland Determination WA Dept. Health Human Services

Washington

Data and field review of 90 acre Fircrest School campus for determination of wetland presence and extent for an environmental site audit. Field delineation of wetlands.

Wetland Restorations/Creations, Various clients

North Dakota

Completed over 80 wetland restoration, creation and enhancement projects on National Wildlife Refuges, National Waterfowl Production Areas, private and tribal lands throughout North Dakota. Responsible for site selection, hydrological/biological suitability investigations, engineering design, cultural resource approvals, permitting, bid-letting, construction layout and supervision. Coordinated with landowners and completed contracts, tracked project budget, wrote grant proposals, recruited new partner organizations, and coordinated activities of all partners (including ND Game and Fish, USFWS, Ducks Unlimited, Nature Conservancy, etc). Represented projects at state/local meetings

Wetland Creation, Turner Enterprises

Montana

Survey, site review, water rights review, project design, flow calculations, construction specifications, permitting, construction designs for 2.7 acre wetland creation for waterfowl habitat.

ADDITIONAL TRAINING

PHABSIM (Physical Habitat Simulation Model) Training -Utah State Univ. 2002
Instream Flow Incremental Methodology (IFIM) Training USGS 2002
Stream Geomorphology and Rehabilitation-University of Washington 2001
Natural Channel Design- Interfluve 2000
Water Quality Monitoring Training-NRCS 1999
Riparian Inventory Techniques -University of Montana 1998
ACOE Wetland Delineation Procedures – 1997
Wetland Construction Design – NRCS 1995

PUBLICATIONS

DeFrancesco, D. and P. Hansen. 2000. The Effectiveness of Streambank Stabilization Techniques for Reducing Bank Erosion on the Upper Clark Fork River, Western Montana. In *Proceedings of the 2000 Billings Land Reclamation Symposium*, Billings, MT.

Chadwick, A., Bozorth, T., DeFrancesco, D., and P. Hansen. 1999. Evaluating Grazing Best Management Practices for Protecting Water Quality in Montana. In *Proceedings of Wildland Hydrology Specialty Conference*. American Water Resources Association. Bozeman, MT.

Hettick, P., Wesienberger, T., DeFrancesco, D., Clayton, S., and P. Hansen. 1999. Field and Software Analysis Techniques for Determining Changes in Streambank Surface Volumes on the Upper Clark Fork River. In *Proceedings of Wildland Hydrology Specialty Conference*. American Water Resources Association. Bozeman, MT.

PRESENTATIONS

"The Effectiveness of Streambank Stabilization Techniques for Reducing Bank Erosion on the Upper Clark Fork River, Montana". 2000. Billings Land Reclamation Symposium. Billings, MT.

"The Effectiveness of Streambank Stabilization Techniques for Reducing Bank Erosion on the Upper Clark Fork River, Montana. 2000. Clark Fork River Watershed Symposium. Missoula, MT.

"The Effectiveness of Bank Stabilization Techniques for Reducing Erosion on the Upper Clark Fork River". 1999. 7th National Nonpoint Source Monitoring Conference. Morro Bay, CA.

"Evaluating Grazing Level Indicators as Grazing Best Management Practices in Montana". 1999. 7th National Nonpoint Source Monitoring Conference. Morro Bay, CA.

"Evaluating Grazing Level Indicators as Grazing Best Management Practices in Montana". 1998. 6th National Nonpoint Source Monitoring Conference. Cedar Rapids, IA.

"Breeding Bird Communities of Prairie Pothole Restored Wetlands" 1995. Midwest Fish and Wildlife Conference. Detroit, MI.

Lee K. Holder, P.E.



Education: B.S. *cum laude*, Environmental Engineering, Rice University, 1977.

Registrations: Registered Professional Engineer (Texas and Washington).

Experience:

1993 to date	Golder Associates <i>Associate; Senior Environmental Engineer</i> Managing and performing water and wastewater treatment system design, site cleanup feasibility studies, and remediation design involving soil, groundwater and sediments for industrial and government clients. Assisting industrial clients in compliance and permitting with air, hazardous waste, and stormwater regulations.	Redmond, Washington
1991 - 1993	PTI Environmental Services <i>Senior Engineer</i> Managed all engineering work performed by the company. Projects focused on feasibility studies under CERCLA and state law (e.g., MTCA), evaluating remediation technologies, and conducting site remediation. Reviewed feasibility studies and RCRA permit applications for the U.S. EPA. Performed a BACT evaluation of refinery air emissions for an oil refinery in Tacoma.	Bellevue, Washington
1984 - 1991	ERM <i>Senior Engineer</i> <i>Project Manager</i> Managed and performed numerous remediation projects for both hazardous and non-hazardous waste sites. The scope of these projects included engineering design, preparation of bid documents, construction management, and closure certification. Managed and performed feasibility studies for several CERCLA sites. Performed numerous projects related to RCRA compliance, including complete Part B permit applications. Performed several projects on NPDES compliance and wastewater treatment design.	Bellevue, Washington Houston, Texas
1983 - 1984	Resource Engineering <i>Project Engineer</i> Consulted on solid and hazardous waste management, including: site investigations at CERCLA sites; investigation and remediation of a PCB-contaminated site; evaluation of landfarm performance; preparation of RCRA closure/post-closure plans; preparation of SPCC plans.	Houston, Texas
1978 - 1981	Charter Oil Company <i>Environmental/Process Engineer</i> Responsible for compliance with federal and state regulations for hazardous and solid waste, wastewater, stormwater, and spill control. Also provided engineering oversight and instituted process improvements for the refinery wastewater treatment system and sulfur recovery complex.	Houston, Texas
1977 - 1978	Rice University <i>Research Engineer</i> Conducted research on hazardous substances for the EPA.	Houston, Texas

SELECTED PROJECT EXPERIENCE

White King / Lucky Lass Mines Superfund Site

Lakeview, Oregon

Managing the design and implementation of remediation for two former uranium mines in south-central Oregon under CERCLA. Golder was retained after completion of the RI/FS to provide (1) design and construction management for the remedy, and (2) biological studies related to water and sediment quality. Golder has completed the Remedial Design (RD) Workplan and a workplan for biological studies in the White King Pond – a mining pit now filled with water – and the adjacent creek. Constituents of concern include radioisotopes (primarily uranium and radium) and arsenic. The ROD identified unresolved concerns over potential impacts to stream sediments and bioaccumulation of metals. Golder is performing field tests of bioaccumulation using mussels, and evaluating appropriate aquatic biological habitat goals. Based on the results of these biological studies, Golder will also assist in determining what, if any, remediation is necessary for the pond and creek. Golder is currently preparing the remedial design of the remedy, which includes consolidating mining overburden stockpiles and capping the combined stockpile.

Pasco Bulk Fuel Terminals Site

Pasco, Washington

Managing the design and implementation of remediation for this large brownfields site under MTCA (state Superfund). The clients are Crowley Marine Services, Inc. and the Port of Pasco. Site contaminants are non-aqueous phase liquid (NAPL), petroleum compounds, and chlorinated volatile organic compounds (VOCs). Retained after completion of the RI/FS and remedy selection to comment on the draft Cleanup Action Plan (CAP). Reviewed the proposed remedy and discovered that the proposed remedial technologies would not meet all of the proposed cleanup levels. Successfully renegotiated the cleanup levels. Also negotiated a revised, flexible remedy that allows using an innovative "adaptive management" approach to allow step-wise remedial design/remedial action (RD/RA). Thus, results of the initial phases of remedial action were used to optimize subsequent RD/RA. Next managed preparation of the MTCA remedial action plans for the site. Treatment primarily consists of in-situ air sparging (IAS) and soil vapor extraction (SVE). Limited pump-and-treat is also used. Golder designed and constructing the full-scale remediation systems, which are now in operation. Golder designed, programmed, and installed the control system and telemetry to allow remote monitoring and control. Golder operates and maintains the treatment systems for the Client.

McKesson Corporation

Omaha, Arkansas

Managed the Feasibility and Treatability Studies for the Arkwood CERCLA site in Arkansas. The Treatability Study covered stabilization (fixation), soil washing, slurry biotreatment, land treatment, and chemical treatment. Alternatives included excavation and off-site disposal, incineration (on- and off-site), on-site landfill, on-site treatment by stabilization (fixation), soil washing, slurry biotreatment, land treatment, or chemical treatment. The EPA selected incineration (due to dioxins), but was convinced to add soil washing to decrease the cost of the remedy by 80%. Negotiated natural attenuation for affected groundwater.

Sheridan Superfund Site

Sheridan, Texas

Performed concept design and evaluation of an incinerator for this CERCLA site in Texas. Assisted in preparation of the Feasibility Study, including all cost estimating.

French, Ltd. Superfund Site

Crosby, Texas

Reviewed prior site investigation documents preparatory to further investigation. Performed site investigation fieldwork.

Allied Signal Corporation

Onondaga, New York

Performed the initial Feasibility Study work on lake sediments for an industrial client at the Onondaga Lake CERCLA site. The constituent of greatest concern was mercury. The work included evaluation of dredging, capping, ex-situ treatment, in-situ treatment.

**Zoecon Corporation (subsidiary of Sandoz) and
Occidental Chemical Corporation**

Dallas, Texas

Managed the design and construction of site remediation for a pesticide plant in Dallas, Texas. Site remediation included soil excavation and disposal, slurry wall construction, capping, and design and construction of a 50-gpm system to recover, treat, and reinject groundwater containing pesticides and hydrocarbons. ReInjection wells were installed inside a building minimal disruption to operations. Soil excavation, slurry wall construction, and treatment system construction were all scheduled to avoid disruption of the facility's raw material deliveries and product shipments.

Occidental Chemical

Dallas, Texas

Performed closure of a hazardous waste surface impoundment at an operating manufacturing plant. Waste in the impoundment, which contained arsenic and elemental phosphorus, was excavated, treated by stabilization, ash, and disposed off-site. An impermeable cap was placed over the remaining contaminated soil.

Continental Can

Longview, Texas

Conducted RCRA (hazardous waste) and UST (underground storage tank) closure activities for an operating can manufacturing facility. The solvent-contaminated soils were remediated on-site by land treatment. Tanks contents (hazardous and non-hazardous wastes) were disposed off-site. Prepared bid specifications, selected the remediation contractor, managed site activities, and certified closure.

Mepco/Centralab (Subsidiary of North American Philips)

Mineral Wells, Texas

Conducted RCRA and UST closure activities for an operating electronics manufacturing plant. Solvent-contaminated soils were remediated on-site by land treatment. Prepared bid specifications, selected the remediation contractor, managed site activities, and certified closure.

Arco

Butte, Montana

Prepared the Development of Alternatives Report for the Smelter Hill operable unit of the Anaconda CERCLA site. Alternatives included extensive evaluation of institutional controls and several approaches to cost-effective reclamation, as well as capping. Excavation and disposal alternatives were rejected as infeasible. The primary constituents of concern were arsenic and lead.

Arco

Houston, Texas

- Investigated closed disposal sites containing tars and other heavy oils for this major oil refinery.
- Evaluated operation of the landfarm at this major oil refinery.

Blackbird Mine Superfund Site

Salmon, Idaho

Golder has assisted the potentially responsible parties (PRPs) on cleanup of this site for many years. Constituents of concern (COCs) include arsenic, copper, and cobalt. Mr. Holder served as Lead Engineer for the Feasibility Study (FS) for this site, managing preparation of conceptual design of remediation alternatives, cost estimating, modeling effectiveness of the alternatives, addressing "substantive compliance" NPDES (permitting) issues, and assisting in remedy negotiations with the agencies (EPA and IDEQ). Performed detailed design of the remedy.

Tulalip Landfill Superfund Site

Marysville, Washington

Lee K. Holder, P.E.



Assisted in preparation of the CERCLA Feasibility Study for the Tulalip Landfill near Marysville and Everett, Washington.

U.S. EPA

Seattle, Washington

- Served as senior technical reviewer for site remediation documents. In this role, performed technical reviews of 5 CERCLA feasibility studies on behalf of the U.S. EPA for the Umatilla Army base in Oregon.
- Provided engineering review of site remediation documents for the EPA at numerous other sites.
- Prepared a technical memorandum discussing the strengths, weaknesses, and costs of soil washing for treating lead-contaminated soils.

U.S. Department of Energy

Hanford Reservation, Washington

- Performed the CERCLA Phase I/II and Phase III feasibility studies for the 300-FF-5 groundwater operable unit. Primary constituents of concern were uranium isotopes. Prepared conceptual design and cost estimates for alternatives including institutional controls, selective and extensive containment (with a slurry wall), and selective and extensive groundwater extraction and treatment. Treatment focused on ion exchange; other metal removal methods (e.g., precipitation and reverse osmosis) were considered but not cost-effective for this site. Alternatives were developed with and without slurry walls to evaluate the cost-effectiveness of containment. Selective and extensive cleanup levels were developed based on risk evaluation, maximum contaminant limits (MCLs), and cost-effectiveness. Institutional controls was recommended based on minimal risk.
- Performed the Phase III (final) Feasibility Study for the 300-FF-1 soils operable unit. Primary constituents of concern were uranium isotopes, cobalt-60, and copper. Prepared conceptual designs and cost estimates for alternatives including soil cover, impermeable capping in-place, excavation and disposal, and soil washing. Evaluated soil washing based on a field (pilot-scale) Treatability Study. Stabilization (fixation) was included in some alternatives.
- Assisted in preparation of the Feasibility Study for the 200-BP-1 operable unit. The recommended alternative was capping and groundwater monitoring.

Whirlpool Corporation

Milan, Italy

Designed and prepared construction bid packages for a 400-gpm groundwater extraction and treatment system. Contaminants were chlorinated volatile organic compounds (VOCs). The extraction system consisted of 26 wells over an area of greater than one square mile within an operating manufacturing facility. The treatment system consisted of precipitation to remove hardness and iron, air stripping for the VOCs, and offgas treatment using catalytic oxidation. The system included a computer control system with telemetry.

Mobil Chemical Company

Texas

- Reviewed spill prevention and control measures for a petrochemical manufacturing facility. Recommended low-cost capital and operating changes to improve effectiveness.
- Prepared a spill prevention plan to address requirements of both spill prevention, contingency and countermeasures (SPCC) regulations and also hazardous waste regulations for the facility. Two versions were prepared: a "full" version for regulatory review and a condensed, focused version for use in operator training.

Exxon

Baytown, Texas

Managed operations of a landfarm within Exxon's Baytown refinery.

Lee K. Holder, P.E.



Confidential Client

Exxon Bayway Refinery, New Jersey

Prepared site remediation cost estimates used in negotiating the potential sale of Exxon's Bayway refinery, on behalf of the prospective purchaser.

Texaco

Napierville, Illinois

Investigated waste disposal sites within an inactive Texaco refinery.

Monsanto Corporation

Soda Springs, Idaho

Assisted in preparation of the Feasibility Study (waste, soil, and groundwater) for a phosphate plant. Groundwater alternatives included containment, pump-and-treat, and combinations of containment and treatment. Primary constituents of concern were metals. Groundwater treatment technologies evaluated included reverse osmosis, ion exchange, hydroxide precipitation, and sulfide precipitation.

Monsanto Chemical Company

Los Angeles, California

Evaluated remediation alternatives for two chemical plants in southern California with arsenic and benzene in soil and groundwater. Performed field test of soil vapor extraction (SVE) for soil cleanup and air sparging for groundwater cleanup.

American Petroleum Institute (API)

Washington, D.C.

- Estimated the effects and nation-wide costs to the oil industry of proposed land treatment permit regulations. The API used the report in preparing comments on the proposed regulations.
- Estimated the effects and nation-wide costs to the oil industry of proposed new hazardous waste listings. The API used the report in preparing comments on the proposed regulations.

Chevron Salt Lake City Refinery

Salt Lake City, Utah

Under a Consent Order with the State of Utah, Chevron had investigated waste sites at its refinery in Salt Lake City. Sixteen wastes sites were identified. Prepared a comprehensive closure plan covering all sixteen sites. Prepared a separate RCRA closure plan for the sites that were hazardous waste facilities. Assisted in negotiations with EPA Region 8 as well as state regulators.

Sound Refining, Inc.

Tacoma, Washington

- Assisted in solving an odor emission problem. The project involved negotiating an agreed order with the Puget Sound Air Pollution Control Agency (PSAPCA), identifying potential odor sources, evaluating control measures, and recommending a cost-effective solution.
- Prepared an analysis of Best Available Control Technology (BACT) for sulfur emissions in response to an order from the Puget Sound Air Pollution Control Agency (PSAPCA). In addition to the BACT analysis, performed an economic comparison of BACT options. The refinery selected replacing aging process heaters as the most economic option. Negotiated an implementation schedule with PSAPCA, and then assisted the refinery in selecting, permitting and installing the replacement process heaters. Prepared the Notice of Construction (NOC) and associated air modeling.
- Assisted in negotiating with the Washington Department of Ecology on a proposed fine for alleged NPDES permit violations. The fine was reduced approximately 30% as a result of the negotiations.
- Performed predesign and design work for improvements to the wastewater treatment system. Assisted the refinery with installation and startup of system improvements.
- Prepared a stormwater management plan for the facility.

Diamond Shamrock

Three Rivers, Texas

Prepared a complete RCRA Part B permit application for an oil refinery. Permitted facilities included a land treatment facility (landfarm) and tank storage.

Lee K. Holder, P.E.



Gulf Oil Products

Pittsburgh, Kansas

Wrote the Post-Closure Care Plan for the evaporation pond at the Jayhawk Plant.

White Pass Alaska

Skagway, Alaska

- Assisting the company with evaluation and purchase of a soil thermal treatment unit.
- Performing permitting work for operation of the unit to treat petroleum-contaminated soils.

Unocal

Beaumont, Texas

- Evaluated options for waste treatment and waste minimization for the Unocal refinery in Beaumont, Texas.
- Performed an engineering evaluation of closure options for a sludge impoundment within the refinery.

Unocal

California, Illinois, and Texas

Performed a RCRA study involving all five of Unocal's refineries to determine the optimal strategy for responding to land disposal restrictions on refinery hazardous wastes. Both regulatory and engineering solutions were evaluated. The study focused on recycling and waste reduction strategies to minimize the cost of waste treatment and disposal. The study involved negotiations with the U.S. EPA and regulators in California, Illinois and Texas.

Unocal

California and Illinois

Performed a waste minimization study for three Unocal refineries. For each of these plants, the study identified types of wastes and characterized individual waste streams. Opportunities were identified for reducing the quantity of waste generated, lowering the toxicity of wastes, and recycling. Waste minimization plans were evaluated and revisions recommended as needed.



Timothy L. Martin, P.E.

Education: M.Sc., Geological Engineering, Washington State University, 1986
B.Sc., Geological Engineering, Washington State University, 1985
B.S., Forest Resource Management, University of Idaho, 1974

Affiliations: Registered Professional Engineer, Washington, Idaho, Ohio, Maryland, Virginia, and Delaware
Member, American Society of Civil Engineers

Experience:

2005 to Date	Golder Associates <i>Principal, Senior Consultant</i> Office Manager/Project Manager/Certifying Engineer for geotechnical projects, the power industry, mining site development, construction management, geotechnical engineering for litigation, transportation, building foundations, new landfill construction, expansions, and closure projects.	Coeur d'Alene, Idaho
1993 - 2005	Golder Associates <i>Associate, Senior Consultant</i> Office Manager of the Golder Richmond, Virginia office. Project Manager/Certifying Engineer for geotechnical projects, the power industry, mining site development, construction management, geotechnical engineering for litigation, new landfill construction, expansions, and closure projects in Virginia, Maryland and North Carolina.	Richmond, Virginia
1990 to 1993	Golder Construction Services, Inc. <i>Senior Engineer</i> Resident Project Manager/Certifying Engineer for large landfill expansions in Maryland and Pennsylvania; Project Manager/Certifying Engineer for numerous landfill expansion and new construction projects in Maryland, Ohio, and Pennsylvania.	Mt. Laurel, New Jersey
1988 - 1990	Golder Associates <i>Project Geotechnical Engineer</i> Design Engineer of a RCRA compliant radioactive-mixed-waste landfill for the Department of Energy, Hanford Nuclear Reservation, Washington; final cover designs for a hazardous waste facility, Kettleman City, California; geotechnical excavation in permafrost for Alyeska along the Alaska Pipeline and the tug dock expansion at the loading terminal, Valdez, Alaska; and Project Manager for local geotechnical projects involving pile supported structures, pavement design, and foundation investigations. Field supervisor for CQA during the construction of Landfill B-19 at the Kettleman Hills Facility, Kettleman City, California. Geotechnical Engineer at the TITISA plant expansion, Tijuana, Mexico; responsibilities included in the design and construction supervision of two access roads, incinerator pads, future expansion platforms, drainage structures, and report preparation. Waste Management's Adam Center South Property expansion, Ft. Wayne, Indiana; duties included field exploration, engineering analysis, and report preparation. Summitville Mine, Summitville, Colorado; responsibilities included slope stability analysis, water balance analysis for a heap leach processing plant, and report preparation. King County, Washington; involved with exploration, analysis, geotechnical design, and project management in a retaining wall project. Project Engineer for numerous studies throughout the Seattle, Washington area, including soil mechanics, pile analysis, and foundation engineering.	Redmond, Washington

Timothy L. Martin, P.E.



1986 - 1987

Golder Associates

Redmond, Washington

Staff Geotechnical Engineer

Live Oak Landfill, Atlanta, Georgia; duties included soil/rock logging and monitor well installation for east and west expansion areas. Field Engineer during the geotechnical investigation of 17 miles of the relocated section of State Route 504 in mountainous terrain near Mount St. Helens for the Washington State Department of Transportation. Basalt Waste Isolation Project, Richland, Washington; responsible for evaluating technical consistency of the Systems Engineering Management Plan. Kettleman Hills Facility, California; duties included CQA observation and on-site laboratory manager for soil/synthetic testing.

GEOTECHNICAL PROJECT EXPERIENCE

Brownfields

Riverstone Development

Coeur d'Alene, Idaho

Design engineer for the base grades, liner system, gas venting system, pipeline, river intake structure, and pump station for a 6-acre man-made lake in the new Riverstone development. The lake, which is approximately 25-feet in depth, is being constructed in an old sand and gravel pit adjacent to the Spokane River in Coeur d'Alene, Idaho. The lake required a liner to maintain water as the subgrade is sand. In addition, some of the previous subgrade is highly organic and therefore the design includes a gas venting system under the liner system. The design includes a safety shelf, an access road into the lake, as well as a pipeline from the river to the bottom of the lake over the liner system. The lake has several aesthetic features, including a waterfall, a railroad car bridge, an artificial stream recycled into the lake, a floating 60-foot fountain, an amphitheater, and fountains from large rock columns. Immediately adjacent to the lake is a bike trail, two restaurants, a business park, and a 4-acre park.

Repository

Big Creek Repository

Kellogg, Idaho

Project Manager for the subsurface site characterization, soil stability analysis and recommendations for design and construction of a proposed vertical expansion of the Big Creek Repository located in Shoshone County, Idaho for the Idaho Department of Environmental Quality. The purpose of the study was to explore the current repository fill and foundation soils (consisting of historic mine tailings) to determine their geotechnical strength parameters relative to the stability of the proposed expansion.

Hydrogeological Investigations

Clover Power Station Stage III Landfill Expansion

Clover, Virginia

Project Manager/Design Engineer for the Part B Permit design for the approximate 90-acre Stage III coal ash monofill landfill expansion. Responsibilities included hydrogeological investigation, obtaining soil and water samples for laboratory testing, analysis of test data, and report preparation. Design responsibilities included preparation of: conceptual, preliminary, and final design drawings, construction specifications, engineering analyses, a final design report, an operations plan, a closure plan, a construction quality assurance plan, an engineer's cost estimate of construction, an estimated construction schedule, and preparation of bid documents.

Adams Center Landfill

Fort Wayne, Indiana

Adam Center South Property expansion, Ft. Wayne, Indiana; hydrogeological investigation for a landfill expansion. Duties included field boring exploration, monitoring well installation, engineering analysis, and final report preparation.

Timothy L. Martin, P.E.



Live Oak Landfill

Atlanta, Georgia

Performed soil/rock borehole logging and monitoring well installation for a hydrogeological investigation of the east and west landfill expansion areas.

NRG Indian River Power Station

Millsboro, Delaware

Project Manager and PE for the permitting, and design of a 120-acre Phase II coal ash industrial waste landfill expansion. Work included a hydrogeological investigation, an environmental assessment, closure design of the existing 43-acre Phase I coal ash landfill as well as the design of the Phase II landfill. The project included developing design drawings, construction specifications, groundwater monitoring plan, operations plan, design report, and a leachate treatment system.

Chesterfield Power Station

Chester, Virginia

Senior Reviewer for a landfill site assessment of the 228-acre property for the Chesterfield Power Station. The purpose of the landfill assessment was to determine if the proposed property may contain a fatal flaw that would prohibit Dominion Generation from permitting the property as an industrial landfill to receive Coal Combustion By-Products (CCB). Golder's landfill assessment included conducting a Phase 1A historical and cultural resource study, a wetlands determination, a survey for endangered species, a review of the property and the adjacent property for water wells and seeps, and a characterization of the soil and the groundwater flow direction study of the property. As part of the assessment, Golder performed a hydrogeological investigation that included three new groundwater monitoring wells and performed sampling of the groundwater to determine the potential from off-site migration of pollutants from an adjacent property.

Mt. Storm Power Station

Mt. Storm, West Virginia

Senior Reviewer and Project Director in the development of a report regarding the observations of the existing leaking leachate ponds at the Mount Storm Power Station. The report outlined five (5) options to either repair or replace the leaking leachate ponds. The report was based on three criteria for the solution to the leaking ponds that included: to maintain one of the ponds in operation while the other pond is repaired or replaced, secondly, to maintain the existing pond storage capacity, and third, to maintain a leak detection zone for the ponds. Golder is currently preparing construction bid documents for the Mt. Storm Power Station project and will perform Construction Quality Assurance (CQA) services during the relining of the coal ash leachate basins.

Possum Point Power Station

Dumfries, Virginia

Senior Reviewer and Project Director during a Phase I Environmental Site Assessment for portion of property at Possum Point Power Station. Phase I was requested by lending institution as part of a property transaction. As a result of the findings of the Phase I, Golder made recommendations to Virginia Power to complete a limited Phase II assessment that revealed the presence of subsurface contamination. Golder prepared a comprehensive subsurface assessment and a Site Characterization Report as required by the Virginia Department of Environmental Quality and a risk assessment. The risk assessment and SCR resulted in no further action required at the site.

Douglas J. Morell



Education: B.Sc., Geology, Miami University, 1973.
M.Sc., Geology (Geochemistry), Miami University, 1978.
Ph.D., Geology (Hydrogeology), University of Idaho, 1985.

Registrations: Licensed Professional Geologist and Hydrogeologist (Washington)

Experience:

1983 to date

Golder Associates

Redmond, Washington

Associate to Principal

Dr. Morell is a Principal with Golder Associates and has over 30 years of experience in contaminant hydrogeology and geochemistry. As a faculty member at the University of Idaho, College of Mines, Dr. Morell taught undergraduate and graduate courses in hydrogeology and hydrochemistry from 1981 - 1982. He was a member of the Hanford Groundwater Modeling Committee and was tasked with identifying appropriate codes and strategies for predicting groundwater migration in the subsurface environment for Hanford CERCLA RI/FS documents.

Responsible for investigation and remediation studies relating to waste management for the chemical, nuclear, and mining industry. He is a well-recognized expert in hydrogeologic evaluations and the fate and transport of hazardous chemicals in the environment. Project manager and technical leader for over 30 CERCLA and State MTCA investigations or remediations. Hydrogeologic characterizations include: the Landsburg site, Norseland site, CERCLA Tulalip Landfill and RECOMP Ash Landfill sites in western Washington and the CERCLA Colbert, Northside and Greenacres Landfills in Spokane, Washington. Dr. Morell was the lead hydrogeologist for the siting and hydrogeologic sections of the SEPA EIS for proposed regional landfills for Spokane, Okanogan and Whatcom Counties. He is the Project manager for groundwater characterizations and monitoring at the U.S. Army Munitions Umatilla Landfill in Oregon. Managed the remedial investigation on an CERCLA and MCTA abandoned petroleum refinery and bulk fuel facility (North Market Street Site in Hillyard) and a PCB Superfund site in Spokane, Washington. Lead hydrochemist for investigation and interpretation of contaminant fate and migration mechanisms of inorganics in groundwater at a CERCLA elemental phosphate chemical plant in Idaho.

Dr. Morell is an expert in organic contaminant fate and transport. He is currently the Technical Reviewer for contaminant (PCE, TCE) migration Phelan Landfill, California where groundwater is at 1,000-foot depths. Dr. Morell co-authored a paper of a research project of the Phelan landfill for Norcal that involved vadose zone modeling and model calibration of the effect of capping on groundwater impacts from subsurface landfill gases. He has performed natural attenuation modeling analysis for PCE and vinyl chloride at the Morongo Valley Landfill, California. Dr. Morell is the Hydrogeological and Geochemical Technical Leader for the CERCLA Kunia RI/FS site, Hawaii where groundwater is over 800 feet deep in fractured basalts, which the contaminants of concern include chlorinated volatile pesticides (EDB, DBCP and TCP).

Currently, Dr. Morell is the hydrogeological leader on long-term pump testing at the CERCLA Blackbird Mine site in Idaho for the purpose of capturing metal impacted groundwater and seeps from discharging to receiving streams in both fractured bedrock and colluvium aquifers. He is currently also the Technical Leader on the Norpetro Chemical site, where Golder is conducting a RFI/CMS for this RCRA site. Past practices included disposal of petrochemical waste bottoms in unlined pits and decant effluents down

Douglas J. Morell



deep well injection systems (up to 750 foot depths). The site is near Padilla Bay in Washington and groundwater is tidally influenced. The RFI is focusing on groundwater pathways to the Bay and natural attenuation mechanisms to determine ecological risks. Several years ago, he has been the project manager of four non-time critical CERCLA investigations and remediation of base-metal mine and mill wastes in the South Fork Coeur d'Alene River Valley in Idaho. Efforts have involved remediation of about 300 thousand cubic yards of tailings impacted (Pb, Zn and Cd) soil, the development of riparian habitat and stabilization of the river within the impacted areas. Dr Morell designed a 1400 foot long groundwater hydraulic barrier and passive groundwater treatment vault system for heavy metal removal at the Success Mine site.

Dr. Morell has conducted numerous evaluations of environmental liabilities and associated costs for property transactions. He was a team member in determining the environmental liabilities associated with the acquisition of an industrial complex (uranium hydrometallurgical plant, acid plant, coal-fired power plant and two uranium mines) in Kazakhstan for a North American venture. Dr. Morell worked with the buyer and seller of an ammonia and methanol manufacturing plant in British Columbia, where he is determining environmental liabilities and anticipated remediation costs for the transaction. Dr Morell recently completed an assessment of environmental liabilities associated with an oil company portfolio including a refinery, six bulk storage terminals, 250 miles of pipelines and 140 gasoline stations.

Assisted Westinghouse with their environmental restoration efforts at the Hanford Reservation. Project manager on "Macro Engineering" approaches to site-wide remediation of contaminated aquifers at Hanford. Several CERCLA Operable Unit RI/FS were completed under the management of Dr. Morell at Hanford Nuclear Reservation in Washington, which involved subsurface vadose and groundwater fate and transport analyses of metals, radioactive isotopes and chlorinated solvents. Project manager and technical leader on the development of the RI/FS reports for radioactive/mixed waste CERCLA 200-BP-1 and 300-FF-5 Operable Units at Hanford.. He has been a member of the Hanford Ground Water Modeling Committee, who was tasked with identifying appropriate codes and strategies for predicting contaminant migration in the subsurface environment for Hanford CERCLA RI/FS documents.

1981 - 1982

University of Idaho

Moscow, Idaho

Dr. Morell was a faculty member at the University of Idaho, College of Mines. He taught undergraduate and graduate courses in hydrology, hydrogeology and hydrochemistry during 1981 and 1982.

1975 - 1981

PEI Environmental

Cincinnati, Ohio

Waste disposal studies for the phosphate rock chemical processing industry at 13 sites, hydrogeologic characterization and surface water/groundwater monitoring at 65 mine sites including copper, gold, lead/zinc, phosphate, and uranium; managed the clean-up from leaking underground petroleum fuel tanks. Assessed waste disposal activities and site conditions at the Homestake Mine's cyanide tailings pond in Lead, South Dakota. Conducted a RI/FS at a organic chemical production plant in Cincinnati, Ohio. Managed an enforcement action for EPA/NEIC where PCB oils and chlorinated solvents (TCE, PCE) were injected into a 3,000-ft deep aquifer in East St. Louis, Illinois. Provided expert testimony on behalf of EPA during litigation with Con Edison of New York, pursuant to the Clean Water Act.

Douglas J. Morell



LITIGATION EXPERTISE AND EXPERIENCE

Dr. Morell has provided expert testimony during litigation between the Region II EPA and electric utility companies (ConEdison of New York, Orange & Rockland and Power Authority of New York) with power plants along the Hudson River. The case was active during the late 1970's and involved impacts to the Hudson River under the auspices of Section 316(B) of the Clean Water Act.

Dr. Morell was the Chief Investigator in a criminal action in 1983 where solvents and PCBs were illegally disposed through an injection well into an aquifer 3000 feet below land surface in east St. Louis, Illinois. The criminal action was conducted by the National Enforcement Information Center (NEIC) of the EPA under TSCA.

He has also provided depositions in a civil case (confidential client) in the late 1980s involving the evaluation of pre-existing environmental conditions and impacts in a property transfer of an automobile dealership and repair shop in the Seattle metropolitan area, where sub-surface contamination was discovered after the property transfer ownership.

In 1995, Dr. Morell provided depositions during civil litigation involving health impacts and odor nuisances to residents living above an old inactive landfill called the Norseland Mobile Estates (Coleman et al. vs. Port of Bremerton et al., 1994). The main concern of the case involved the existence and migration of landfill gases into breathable ambient and in-door air. Background ambient air studies and ambient air monitoring of odor events were completed to identify whether the landfill at Norseland was the source.

Dr. Morell provided expert review and affidavits for litigation between Lockheed Aeronautical Systems Company and Moore Drums in Charleston, South Carolina in 1996. Provided expert opinion on the fate and migration of chlorinated solvents in the groundwater and emissions to the atmosphere for health risk to on-site employees.

Dr. Morell has provided expert oversight for litigation on a Home Depot facility in 1999. This case involves damage to a new Home Base building where the subgrade fill material was fly ash originating from coal fired power plants. Damage was allegedly caused by fly ash swelling from the formation of hydrated minerals reacting with moisture. The one year old 130,000 sq. ft. building has recently been demolished and will be replaced. Dr. Morell's involvement is to statistically design a sampling and analysis program to characterize the fly ash materials underlying the building for data to be used during litigation.

In 1998, Dr. Morell has provided expert report for Kitsap County on residual contamination at the Crown Hill School in Kitsap County, Washington. The report provided an opinion on the potential liability associated the contamination from past ownership of the site.

Dr. Morell provided expert analysis and assessment of the potential for multiple volatile chlorinated fumigants to impact municipal water supply wells in Oahu, Hawaii in fall 2000. This effort was in response to the formulation of liable parties of current and future impacts to major well fields from fumigants used in agricultural fields on the island. Evaluation involved fate and transport analyses and groundwater flow system delineation for the west region of the island. An assessment was made of influence from pumping supply wells on contaminant migration toward the wells.

In 2001, Dr. Morell was retained for depositions on the Natural Resource Damage Assessment litigation (United States vs. ASARCO et al.) on behalf of the defendants. The case involved environmental impacts and damages from mining practices during the last century to the Coeur d' Alene River and basin.



Douglas J. Morell

In the summer of 2002, Dr. Morell was retained for expert testimony for a defendant on impacts to a private groundwater supply well from leaking underground fuel storage tanks in Texas. His testimony was focused on the fate and transport of petroleum hydrocarbons potential to impact the water from the supply well. This case was settled before trial.

Dr. Morell has provided expert affidavits and depositions in Fall 2002 for a plaintiff whose groundwater supply was threatened by contamination from chlorinated solvents from defendant's operations. The well supply system has a capacity of 40 million gallons per day for a public of about a million people. The case settled shortly after trial began.

Dr Morell was retained as an expert witness in 2003 for a defendant associated with dry cleaning equipment. Groundwater in this California city has been impacted with PCE and threatens the City's well water supply system. The current plans are to conduct sufficient investigations to determine the cause of the impacts, evaluate appropriate remedial measures and estimate remedial action costs for litigation with the plaintiff.

Currently, he has been retained as an expert to review soil remediation of petroleum hydrocarbons using amendments.

Bryony Stasney



Education: B.Sc., (First Class Hons.), Geology, Imperial College, London, United Kingdom, 1991.
M.Sc., Hydrogeology, University of British Columbia, Vancouver, BC, 1994.

Affiliations: Licensed Hydrogeologist in Washington.
Fellow, Geological Society of London, United Kingdom.
President (2007) & Board Member, Society of Inland Northwest Environmental Scientists
Technical Advisory Committee, Spokane Valley Rathdrum Prairie Aquifer Bi-State Study

Experience:

1998 to date	Golder Associates	Redmond, WA (1998 to 2000) Coeur d'Alene, ID (2000 to present)
	<i>Senior Project Hydrogeologist</i> Responsible for hydrogeologic characterization studies for watershed assessments and groundwater supply development and protection, including data compilation and assessment, field oversight of drilling, well and piezometer installation, surface water and groundwater sampling, collection and analysis of water quality and aquifer test data, data analysis and interpretation using analytical and numeric computer models and reporting. Also responsible for coordinating and facilitating watershed planning projects in eastern Washington, including scoping and completion of technical tasks and working with diverse stakeholder groups to develop watershed scale management plans.	
1997	School of Engineering Technology	Vancouver, British Columbia
	<i>Instructor</i> Instructor at the British Columbia Institute of Technology for "Environmental Controls for Landfills", a B.Eng. credit course covering landfill leachate and gas generation, containment and collection, field investigation and monitoring techniques.	
1995 - 1997	Sperling Hansen Associates Inc.	North Vancouver, British Columbia
	<i>Hydrogeologist</i> Responsible for technical development and project management of hydrogeological investigations, design and operation plans and closure plans for landfills across British Columbia. Responsibilities included proposal preparation, development and completion of field studies, data analysis, report writing and presentation.	
1995	Gartner Lee Ltd.	Vancouver, British Columbia
	<i>Hydrogeologist</i> Responsible for field supervision of drilling and test pitting, groundwater monitoring well installation and sampling, data collection and analysis, and report writing on environmental site assessment projects for private, corporate and public sector clients.	
1994	Bullmoose Coal Mine	Tumbler Ridge, British Columbia
	<i>Student</i> Haul truck operator and research student for Master's project on the viability of an engineered wetland system to reduce elevated levels of nitrate within coal mine effluent.	
1992	Mott MacDonald	United Kingdom
	<i>Trainee Geotechnical Engineer</i>	

SELECTED PROJECT EXPERIENCE

SITE CHARACTERIZATION AND REMEDIATION

Pend Oreille Mine Remedial Investigation / Feasibility Study Metaline, Washington

Senior Hydrogeologist responsible for public outreach planning and informing the public at each key step in the investigation and cleanup of two inactive tailings disposal facilities.

City of Moses Lake, RI/FS

Moses Lake, Washington

Project Hydrogeologist for an MTCA RIFS conducted under an Agreed Order with Ecology. Responsible for workplan development, field work (groundwater sampling, test pitting, drilling and monitoring well installation, geoprobes), data analysis and reporting.

GE Spokane, Groundwater Monitoring

Spokane, Washington

Project Hydrogeologist responsible for on-going quarterly groundwater sampling for PCB compliance monitoring at a WA State Superfund site.

Success Mill Groundwater Capture and Treatment

Wallace, Idaho

Project Hydrogeologist working with the Success Planning Team (Silver Valley Natural Resource Trustees, local, state and federal agencies, the Coeur d'Alene Tribe and the public) to develop the optimum response alternative to minimize migration of heavy metals into the creek downgradient of a 200-350,000 cubic yard tailings pile. Responsible for data collection and analysis, report preparation and presentation of the findings to the Success team and to the public.

WATERSHED PLANNING

Watershed Assessments, WRIA 55 and 57

Spokane, Washington

Project Hydrogeologist for the WRIA 55 and 57 (Little Spokane and Middle Spokane watersheds) Planning Unit. Responsible for data collection and analysis for geologic and hydrogeologic information relevant to the watersheds, report preparation and presentation of the findings to the Planning Unit.

GROUNDWATER SUPPLY MANAGEMENT

Spokane County Water District #3, Municipal Supply Well

Pullman, Washington

Senior Hydrogeologist and project manager responsible for data review and analysis for siting, drilling and installation of a new municipal groundwater supply well for Spokane County Water District #3.

City of Pullman, New Municipal Supply Wells

Pullman, Washington

Completed hydrogeologic data review and analysis for siting new municipal groundwater supply wells for the City of Pullman and responsible for drilling, sampling, installation and testing oversight for the new well.



John R. Swift, P.E.

Education: A.A.S., Civil Engineering Technology, Mesa College, 1985
B.S.C.E.T., Civil Engineering Technology, Oregon Institute of Technology, 1988
Post Graduate Studies, Construction Engineering, University of Washington

Affiliations & Certifications: Registered Professional Civil Engineer (Washington, Oregon, Idaho, and Montana)
American Society of Civil Engineers (Member)
Construction Institute
Geo Institute
40 Hour OSHA Hazardous Materials Training.
MSHA Mine Safety Training
U.S. Army Corps of Engineers "Construction Quality Management for Contractors"

Experience:

2005 to Present **Golder Associates** **Coeur d'Alene, Idaho**
Senior Engineer
Project manager and design engineer for geotechnical and environmental projects for residential and commercial developments. Performs engineering economic analysis for landfill permitting. Design and construction documentation preparation for landfill, land development, environmental, and mining projects. Manages geotechnical investigations and evaluations for residential, commercial, and industrial development. Supervises interdisciplinary staff. Performs marketing and client development duties.

1988 to 2005 **Golder Associates** **Redmond, Washington**
Staff Engineer to Senior Project Manager/Engineer
Design and construction documentation preparation for landfill, environmental, and mining projects. Manages construction observation and Construction Quality Assurance/Control projects associated with the construction of landfills, deep excavation shoring systems, mines as well as site development. Manages geotechnical investigations and evaluations for residential, commercial, and industrial development. Also manages the design of mechanically stabilized earth (MSE) and gravity wall retaining wall systems.
Prepares, implements, and manages project health and safety plans.

SELECTED PROJECT EXPERIENCE

Weyerhaeuser Paper/Lumber Mill Remediation **Everett, Washington**
Mr. Swift was the General Contracting Superintendent for the remediation of hydrocarbon, PCB, and wood preservative contaminated soils during the decommissioning and demolition of a paper and lumber mill located on the Snohomish River. The remediation consisted of determining the extents of the contamination with field laboratory analysis, excavating the contaminated soil, and shipping it to authorized landfill facilities in eastern Washington and Oregon.

The Reserve at Newcastle, Boitano Construction **Newcastle, Washington**
Single family residential development. Methane mitigation and venting design for construction of several new houses over coal beds and in the vicinity of a closed landfill.

John R. Swift, P.E.



Black Bird Mine Reclamation

Cobalt, Idaho

Mr. Swift was a Design Engineer, Field Engineer, and CQA Site Manager for the Blackbird Mine reclamation for Noranda Mining near Cobalt, Idaho. Also was the Health and Safety Officer for Golder site personnel.

Success Mine Reclamation

Wallace Idaho

Mr. Swift was a Design and CQA Manager for a semi-passive groundwater treatment project associated with the reclamation the Success Mine waste rock dump north of Wallace, Idaho.

Interstate Mine Reclamation

Kellogg, Idaho

Mr. Swift was the CQA Manager for the construction of a low permeability cover over waste rock at the Interstate Mine in the Kellogg, Idaho area.

White King and Lucky Lass Mines Superfund Site

Lake County, Oregon

Mr. Swift was the Safety Manager and Certifying Engineer for the remediation and closure of two uranium mines. Mr. Swift administered the Golder Site Safety Program and reviewed all construction quality assurance work and environmental evaluation and monitoring at the site. He also reviewed and commented on contractor submittals, RFIs, operations plans, and design modifications.

Richard E. Sylwester



Education: B.S., Geological Oceanography, University of Washington, 1969.
M.S., Engineering Geophysics, University of Washington, 1971.

Affiliations: Environmental and Engineering Geophysical Society
Association of Engineering Geologists
American Society of Civil Engineers
Society of Exploration Geophysicists
Marine Technology Society

Registrations: Registered Geologist State of Washington (No. 2445)
Registered Engineering Geologist State of Washington (No. 2445)

Experience:

1991 to date	Golder Associates <i>Associate-Senior Marine Geophysicist</i> Mr. Sylwester is an engineering geophysicist with over 37 years of experience in all aspects of geophysical operations. At Golder he is responsible for directing and supervising terrestrial, borehole and offshore geophysical investigations. He has been responsible for planning, conducting and analyzing geophysical data from over 350 projects where the mapping of subsurface contaminants, utilities, fuel lines, underground storage tanks and miscellaneous buried debris was the primary project objective. He has extensive experience in the operations, acquisition and analysis of data obtained with ground penetrating radar, magnetometers/gradiometers, utility locators, time and frequency domain electromagnetic systems, seismic refraction and reflection systems, and electrical resistivity imaging systems. In addition he has been the project director responsible for geophysical investigations using borehole logging methods for ground water studies and mapping contaminant plumes. He has directed geophysical investigations related directly to environmental remediation at over 15 military bases, 60 industrial sites, and 15 municipal landfills.	Redmond, Washington
1987 - 1991	Williamson & Associates, Inc. <i>Senior Geophysicist</i> Responsible for planning, conducting and analyzing data for over 100 geophysical surveys for geotechnical, geohazard and environmental projects	Seattle, Washington
1982 - 1987	Northern Technical Services <i>Senior Geophysicist</i> Conducted more than 150 marine and terrestrial geophysical surveys for geohazard studies, for remediation of industrial sites, investigations of landfills, and hazardous waste sites and marine pipeline corridors, port and harbor development,	Redmond, Washington
1976 - 1982	U.S. Geological Survey <i>Chief of Marine Operations</i> Directed the Marine Operations Group that provided vessels and technical support for marine studies on the U.S. Atlantic Coast and Gulf of Mexico. Responsible for specifying and purchasing geophysical equipment, planning and conducting marine surveys, performing data analysis and preparation of final reports.	Woods Hole, Massachusetts

REPRESENTATIVE TERRESTRIAL GEOPHYSICAL PROJECT

George AFB

California

A comprehensive terrestrial geophysical investigation was conducted on over 200 acres of George AFB under the supervision of Mr. Sylwester. A preliminary investigation using ground-penetrating radar, magnetometry, and electromagnetic induction was conducted to locate possible areas of buried waste. Following analysis of the data from this survey a detailed geophysical survey was conducted in those areas to accurately define the lateral boundaries and thickness of waste materials. Additional borehole geophysical investigations were conducted in conjunction with installation of monitoring wells to assess levels of contamination.

North Market Street Investigation

Spokane, Washington

A comprehensive geophysical investigation was directed and conducted by Mr. Sylwester and three geophysicists in the Hillyard Area of Spokane. The objectives of the study were to map subsurface debris, buried tar pits, and utilities at a bulk fuel distribution depot, and an abandoned oil refinery.

Mica Landfill Investigation

Spokane, Washington

Mr. Sylwester developed the geophysical work plan, supervised the field investigations and performed the data analysis for this 200-acre NPL site. The geophysical investigation used ground-penetrating radar, electromagnetic induction, resistivity, and seismic refraction and borehole electromagnetic induction. Results from the geophysical data were used to select locations for the placement of monitoring wells.

Grand Forks AFB Investigation

Grand Forks ND

A geophysical investigation was undertaken on a 130-acre site within the New Sanitary Landfill Area (NSLA) at Grand Forks AFB to locate the lateral extent of buried landfill cells and to locate buried ferrous objects that may represent drums containing hazardous materials. Golder geophysicists used terrain conductivity surveys to locate the limits of buried waste and a magnetometer/gradiometer to locate buried ferrous metal. Terrain conductivity surveys used both quadrature and in-phase measurements obtained by electromagnetic induction. The survey was designed with a grid size that had nearly a 100% probability of locating landfill cells greater than approximately 25 feet by 25 feet, which were confirmed by subsequent drilling.

Homestead AFB Investigation

Idaho

Geophysical investigations were undertaken at four sites on Homestead AFB to locate buried ferrous objects and to determine the lateral and vertical extent of buried waste. A GEM GSM-19 and an EM-31 terrain conductivity meter were used as reconnaissance tools to locate zones of anomalous conductivity or magnetic field changes. GPR was used in the anomalous zones to further define the anomalies and to determine the depth of any landfill materials.

USACOE Whittier Harbor Investigation

Whittier, Alaska

A geophysical investigation was performed at the Whittier Harbor in Whittier, Alaska. The investigation used EM-31, EM-61, magnetometry, ground penetrating radar, and seismic refraction to characterize subsurface conditions for the proposed harbor expansion. Of particular interest was the depth to bedrock, depth to the water table, the presence of debris, soil contamination, and the location of utilities. Areas of anomalous EM, magnetometry, and GPR response were interpreted as suspected locations of buried debris. The water table was detected with seismic refraction and interpreted to be 20-25 feet deep. GPR and Radiodetection data were used to construct a utility location map for the site.

Richard E. Sylwester



DOE Investigations

Conducted geophysical investigations to locate and mapped buried debris, both ordnance and potential contaminants, on numerous military facilities and Department of Defense sites throughout the US. Some of these sites include Los Alamos National Lab, Idaho National Engineering Lab, Hanford Nuclear Reservation, Fairchild AFB, Umatilla Army Depot, Kirtland AFB, Navy Homeport Everett, Bangor Nuclear Submarine Facility and Keyport Naval Facility.

Continental US

USACOE-Presidio

Mr. Sylwester was Project Manager and Senior Geophysicist for an extensive ground penetrating radar survey to locate and map subsurface utilities, fuel lines, and abandoned fuel tanks on this 500 acre site.

San Francisco, California

WSDOT On-Call Geophysical Contract

Under Mr. Sylwester's direction Golder Associates was awarded a second 2 year on-call contract to provide geophysical services for Washington State Department of Transportation in support of design and construction of new bridges, roadway projects, evaluation of potential roadway failures resulting from earthquakes; and design of embankment structures and rock wall cuts. The geophysical work is supervised by Mr. Sylwester who also conducts a significant portion of the offshore field work in addition to conducting terrestrial and borehole geophysics (seismic refraction and reflection, borehole P and W wave studies, optical televiewer imaging, electrical resistivity imaging, ground penetrating radar and SASW).

Washington State

Paul E. VanMiddlesworth



Education: B.Sc., Geology, University of Tennessee, Knoxville, 1992
M.Sc., Geochemistry, University of Idaho, Moscow, 1996

Experience:

2005 to Present

Golder Associates

Coeur d'Alene, Idaho

Project Geochemist

Mr. VanMiddlesworth has conducted environmental investigations for private, corporate, government and tribal sectors for over 10 years. Current responsibilities include developing technical work plans for field investigations, hydrogeochemical assessments, Phase I Due Diligence assessments, remedial action operations and corrective action plans, as well as preparing health and safety plans and regulatory permits. Other duties include overseeing environmental and geotechnical drilling, borehole logging, design and construction of monitoring wells and piezometers, seep sampling, groundwater monitoring, soil excavation, wetland delineation, dynamic cone penetrometer testing, data management, and reporting. Mr. VanMiddlesworth also conducts contaminant pathway migration analyses to assess the aqueous solubility of metals, plume migration dynamics, and potential health hazardous to humans and environmental receptors.

2003 – 2005

URS Corporation

Spokane, Washington

Senior Geologist / Environmental Scientist

Developed site work plans, project proposals, data quality objectives, quality assurance project plans, and strategic planning for site investigations and hydrogeochemical assessments at RCRA sites, timber facilities, public utilities, and air force bases. Supervised environmental/geotechnical drilling activities, monitor well installation, hydropunch sampling, groundwater monitoring, soil excavation, and wetland delineation. Maintained soil bioventing systems and air sparging wells at petroleum remediation sites.

2000 – 2003

Geomega Environmental Consultants

Boulder, Colorado

Staff Geochemist

Developed field sampling and analytical plans, monitoring well design and installation, installed multi-level piezometers, evaluated fate and transport of contaminants, and generated technical reports. Oversaw drilling activities, downhole-geophysics programs, borehole logging, and soil/groundwater sampling. Specialized duties included use of field spectrometer, regulatory compliance audits, hydrogeochemical modeling, bench-scale roll-type batch tests, column leaching experiments, and geochemical forensics.

1998 – 2000

Brown and Caldwell

Denver, Colorado

Associate Geochemist

Performed Phase I/II ESAs, supervised geotechnical/environmental drilling, borehole logging, soil/groundwater sampling, soil excavation, data validation, and database design/management. Other duties included monitoring cement kiln dust landfill sites, geochemical modeling, and proposal preparation.

1997 – 1998

Environmental Management Consultants

Grants Pass, Oregon

Laboratory Technician / Environmental Scientist

Performed groundwater and stormwater monitoring at timber industries, mine sites, and municipal landfill facilities. Oversaw Phase I/II ESAs, asbestos abatement, soil excavation, and data management activities. Responsible for operation and maintenance of laboratory analytical equipment (GFAAS, GC, UV-Visible Spectrometer).

ENVIRONMENTAL PROJECT EXPERIENCE

Moses Lake City Maintenance Facility Corrective Action Moses Lake, Washington

Supervised and implemented excavation and remediation of soil and groundwater impacts related to petroleum hydrocarbon release(s) from former site underground storage tanks, motor oil disposal and equipment cleaning activities. Primarily responsible for soil sampling and analysis, data evaluation, stormwater management activities, coordination of haul trucks, monitor well installation, schedule site visits with Washington Ecology representative, and collect soil and groundwater confirmation samples following remedial activities.

Groundwater Monitoring at CERCLA Site Spokane, Washington

Supervise quarterly groundwater monitoring program and perform maintenance tasks at General Electric former transformer service shop. Collect groundwater samples for analysis of PCBs, measure water levels, assimilate field and analytical data, develop potentiometric maps, and produce quarterly and annual technical reports.

Soil and Groundwater Remediation Activities Spokane, Washington

Monitored groundwater air sparging wells and soil bioventing systems for Priority 1 and 2 Sites at Fairchild Air Force Base to remediate subsurface petroleum impacts and comply with the Air Force Center for Environmental Excellence (AFCEE), Washington State Department of Ecology (WDOE), Spokane County Air Pollution Control Authority (SCAPCA), and U.S. EPA environmental regulatory requirements. Per ROD directives, managed the collection of soil-gas samples from vapor monitoring points, maintained soil bioventing wells, installed groundwater monitoring wells, collected groundwater hydropunch samples, installed soil borings, and delineated dissolved-phase and free-phase LNAPL and DNAPL plumes.

Remedial Investigation/Feasibility Study Metaline Falls, Washington

Installed a multitude of test pits, directed drilling of investigation boreholes, designed and constructed monitoring wells, logged borehole cuttings and split-spoon samples, and supervised field activities to collect groundwater, surface water and sediment samples at historic tailings disposal facilities at the Pend Oreille Lead-Zinc Mine. Performed pump-test and slug-tests to characterize the hydrogeologic conditions of the tailings material, assisted in vegetation and agronomic sampling to determine uptake and bio-availability of metals, and monitored temporal changes in groundwater chemistry and potentiometric levels.

Pasco Bulk Fuel Terminals Site Pasco, Washington

Performed groundwater monitoring activities at former bulk fuel site located on the Columbia River, including collecting groundwater samples for analysis of petroleum hydrocarbons, sounding static water level in monitoring wells, and measurement of field geochemical parameters.

Former Chevron Refinery Remedial Investigation Kenai, Alaska

Installed multiple piezometers in a 900-foot Groundwater Recovery System at the base of a sea bluff to characterize the geologic continuity of in-situ aquifer units, monitor groundwater and LNAPL recovery, and determine oil plume migration pathways, including a multi-level piezometer to monitor differential dissolution of hydrocarbons in groundwater. Collected transducer data to monitor the tidal flux of the Cook Inlet on groundwater flow and plume migration. Installed groundwater monitoring wells and collected in-situ soil samples from an oily waste impoundment area. Performed bail-down tests in wells containing free hydrocarbon product to estimate plume migration rate, performed rising-head displacement (slug) tests and pumping test to determine aquifer hydraulic characteristics, characterized hydrocarbon products in groundwater using geochemical forensics techniques, and produced animated sequence of free product plume migration. Coordinated efforts with Chevron Environmental Management and Alaska Department of Environmental Quality to develop risk-based cleanup levels and determine remedial options.

Paul E. VanMiddlesworth



Subsurface Investigation of Wrecking Yard

Ponderay, Idaho

Installed auger borings and temporary groundwater monitoring wells to assess the nature and extent of hazardous substances and petroleum product surface releases from car crushing activities at the site. Responsibilities included establishing a sampling grid over the target area, advancing hand-auger borings to approximately 15-feet bgs at the grid nodes, field-screening of soil samples using a photo-ionizing detector (PID) using a headspace analytical method, logging subsurface soil conditions, collecting representative surface and subsurface soil and groundwater samples to characterize any releases, and submitting a final report to Idaho Department of Environmental Quality (DEQ).

RCRA Site Investigation and Corrective Measure Study

Omak, Washington

Performed Site Investigation at Colville Indian Power and Veneer facility to comply with U.S. EPA and Colville Tribal Environmental Trust Department CAOC environmental investigation requirements. Activities included designing and installing groundwater monitoring wells, subsurface geophysical survey, in-situ aquifer testing, geotechnical borings, historical records review, regulatory compliance audit, soil/groundwater baseline studies, and soil/groundwater sample collection. Set-up database and evaluated remedial options and activities as part of risk-based corrective measure study to reduce potential exposure of petroleum-impacted soils to on-site workers and local wildlife.

Fluid Removal and Environmental Compliance Audit

Inchelium, Washington

Developed fluid management plan for Inchelium Tribal Wood Treatment Plant to comply with environmental requirements ordered by U.S. EPA and Colville Tribal Environmental Trust Department CAOC. Pumped 60,000 gallons of copper-chromated-arsenic (CCA) effluent wastewater from ASTs and USTs for treatment and disposal, developed a stormwater management plan to eliminate CCA effluent generation, performed environmental compliance audit, and formulated a corrective measure plan for facility to utilize remaining fluids and mitigate groundwater plume migration.

Cyanide Heap Leach Pad Closure

Bald Mountain, Nevada

Wrote Environmental Assessment for closure of cyanide heap leach pad at Bald Mountain Mine in Nevada. Reviewed RI/FS for site, evaluated heap draindown and effluent management strategies, assessed the affected environment and environmental consequences, proposed mitigation measures, recommended monitoring programs, and worked closely with Nevada BLM regulators.

Former Chromite Ore Refinery Site Characterization

Jersey City, New Jersey

Collected in-situ samples of sediments, organic meadow mat, and chromium ore processing residue (COPR) using double-cased hollow stem auger with a direct push split-spoon core barrel, installed temporary piezometers with a geoprobe, collected groundwater hydropunch samples, analyzed groundwater samples for Cr^{III} and Cr^{VI} using a HACH field spectrometer, retrieved soil samples and constructed soil columns to perform laboratory bench-scale leachability tests and roll-type batch tests. All field and laboratory results were used for legal support and evidence in expert witness litigation and testimony.

Groundwater Hydrogeologic Investigations

Bakersfield, California

Directed drilling of soil borings and installation of groundwater monitoring wells for groundwater hydrogeologic investigation and monitoring of oil-field water disposal activities in Bakersfield, Cymric, Maricopa, Taft, Lost Hills, and Belridge Oil Fields. Developed monitoring program for ChevronTexaco, Aera, Valley Waste Disposal Company, and California Regional Water Quality Control Board to monitor groundwater mounding effects from percolation ponds and injection wells. Continuous soil cores were retrieved using a reverse-rotary mud drilling rig with a 94-mm Christensen core barrel, soil cores were logged and preserved for geophotography, and open-borehole geophysics was performed. Groundwater samples were collected and analyzed, and field hydraulic conductivity (slug) tests were performed. Responsible for data analysis, geophysical log interpretation, preparation of technical reports, and incorporation of hydrogeologic data into a 3-D EVS groundwater flow model and the Southern San Joaquin Valley regional groundwater monitoring database system.

Charles C. Haury, M.S., CIH, CSP



Education: M.S., Occupational Health Drexel University, 1981
B.S., Biology Florida Institute of Technology, 1977

Affiliations/Certifications:

American Industrial Hygiene Association (AIHA)
Florida Section Executive Committee (President 2000-2001)
Certified Industrial Hygienist (#2229)
Certified Safety Professional (#11000)
Licensed Asbestos Consultant in Florida (IA00000006)

Experience:

1996 to date	Golder Associates	Jacksonville, Florida
	<i>Corporate Health and Safety Officer / Consultant Scientist – Compliance Programs.</i> Maintains a diverse practice in occupational safety and health throughout Florida. Provides marketing and technical support for all Florida offices. Specialty areas include indoor environmental quality, hazardous waste safety and health programs, industrial hygiene, occupational safety, and asbestos and lead-based paint management. As the Corporate Health and Safety Officer, manages the corporate safety program for 700 employees in over 25 offices.	
1994 to 1996	KBN Engineering and Applied Sciences, Inc.	Jacksonville, Florida
	<i>Regional Office Manager.</i> Initiated the Jacksonville regional office in 1994. With a staff of five professionals, provided industrial hygiene, safety, audits, aquatic toxicology and assessments in Florida and the Caribbean basin.	
1991 to 1994		
	<i>Senior Scientist.</i> Manager of industrial hygiene services for KBN. Provided technical and marketing support for all KBN offices.	
1989 to 1991	Environmental Science and Engineering, Inc.	Gainesville, Florida
	<i>National Program Manager.</i> Managed a national sales and technical support effort for ESE's 1,700 employees in 30 offices for the asbestos, lead and industrial hygiene program.	
1986 to 1989		
	<i>Division Manager of Industrial Hygiene.</i> Managed a division of two departments and a total of 10 staff members. Performed industrial hygiene services for clients throughout Florida.	
1983 to 1986		
	<i>Department Manager of Industrial Hygiene.</i> Department and project manager for a variety of industrial hygiene projects including asbestos, air sampling, ventilation, noise, indoor air quality and training.	
1978 to 1983	Harshaw Chemical Company	Gloucester City, New Jersey
	<i>Environmental Control Supervisor.</i> Managed air pollution program including source testing and inventory, air permits, SO2 and particulate scrubber monitoring instrumentation. Interface with EPA and state officials during compliance inspections. Designed and instituted industrial hygiene evaluation of new processes; design of ventilation systems; air sampling for metals, organics, and asbestos; extensive work with OSHA regulations and compliance.	

**PROJECT EXPERIENCE - HAZARDOUS WASTE/MATERIAL
MANAGEMENT**

Corporate Health and Safety (GAI)

USA and Canada

Provides corporate health and safety support for compliance with HAZWOPER requirements. Support includes teaching 8-hour refresher courses and reviewing and preparing health and safety plans (HASPs). Coordinates national network of office health and safety coordinators (HSC).

University of Florida

Gainesville, Florida

Responsible for the identification and disposal of several thousand unknown waste chemicals from the University of Florida's research laboratories. Project included the use of field screening techniques to fingerprint chemicals for safe disposal. A system was developed to include a sequence of field screening stations along which samples were moved until they were sufficiently identified for disposal. Classes of chemicals identified included flammables, reactives, toxics, caustics, acids, and chlorinated compounds.

**State of Florida Department of
Environmental Protection**

Various Locations, Florida

Remedial Investigations/Feasibility Studies at State Hazardous Waste Sites - Work conducted for Florida Department of Environmental Protection (FDEP) at 22 sites identified as being potentially hazardous. The results of these investigations and a discussion of alternative remedial actions were presented in a Final Report.

USATHAMA Rocky Mountain Arsenal

Denver, Colorado

Responsible for all the safety and health aspects of a remedial investigation for USATHAMA. A variety of instruments used to detect toxic compounds.

United States Environmental Protection Agency

Seymour, Indiana

Monitored air during drilling operations at a Superfund site. Provided site-specific training to new personnel.

USATHAMA

Charleston, West Virginia

Involved 29,440-man-hour comprehensive environmental contamination survey, assessment and remedial alternatives analysis (RI/FS) program for the CERCLA (Superfund) site, ranked 86th on the National Priorities List (NPL)

University of Florida

Various Locations

Forty-Hour Hazardous Materials/Site Investigation Course, Instructor-Course covers all aspects of hazardous waste/materials site safety. The course includes lecture-type instruction, hands-on sessions, field exercises, and examinations.

PROFESSIONAL EXPERIENCE - WORKPLACE ASSESSMENTS

Confidential Client, Concrete Pipe Manufacturer

Retained by the client's attorney to provide OSHA litigation support. Comprehensive confined space and lock-out/tag-out programs were compiled and delivered to the client at the manufacturing location. Air sampling was complete for silica generated as the result of grinding activities. Dosimeter studies were completed to assess the noise exposure of facility employees. Rapid completion of these studies allowed the client to minimize the impact of OSHA citations.

Jacksonville Electric Authority

Jacksonville, Florida

Performed comprehensive personal protective equipment (PPE) assessments for all power, water and waste treatment facilities. Extensive tables were compiled that indicated the hazards and appropriate matching PPE. Other studies included safety assessments to determine OSHA compliance and review of the JEA arsenic program.

U.S. Filter Corporation

St. Augustine, Florida

Performed an industrial hygiene assessment of a filter extrusion operation in St. Augustine, Florida. Air samples were collected for trimethylamine, styrene, and divinyl benzene. Recommendations were also made for improvement of the local exhaust system used to ventilate the work area.

Maidenform

Jacksonville, Florida

Collected air samples for NO₂, ammonia and amines. Employees had complained of irritation during a molding process in which a visible plume was produced. Ammonia was detected and recommendations were made to modify the existing local exhaust by moving the collection system closer to the molding machine.

Confidential Client, International Airport

Retained by the County Attorney's Office to provide air monitoring services in the airport complex. Air samples were collected on a continuing basis for carbon monoxide, polynuclear aromatic hydrocarbons, and particulate matter. The arrival area of the airport is semi-enclosed and pollutant dispersal is slow. Specific recommendations were made to reduce air pollutants in the arrival area through mechanical ventilation, use of cleaner fuels, and traffic management.

Vistakon (Johnson and Johnson)

Jacksonville, Florida

Comprehensive measurements were taken of methyl chloroform in a contact lens manufacturing plant. Studies indicated the need for both engineering and work practice controls. Provided recommendations for exhaust ventilation and generated a hood design used by the client. Also provided safety and health audit of all facility operations.

Savannah Electric Audit Protocol Document

Savannah, Georgia

Project included reviewing plant operations and existing permits to evaluate compliance with all applicable federal and state environmental regulations. A protocol document was developed for the company as a guide for future in-house environmental audits. A comprehensive industrial hygiene audit criterion was included.

Northern Telecom

West Palm Beach, Florida

Collected air samples for Pb and Cellosolve® compounds in a circuit board manufacturing area. Provided recommendations for contaminant control through ventilation additions.

Charles C. Haury, M.S., CIH, CSP



Wenczel Tile Company

Tampa, Florida

Developed air sampling data for respirable silica dust in a ceramic tile manufacturing facility. Proposed engineering controls to reduce silica exposure. Worked with client attorney to defend OSHA citation and compliance schedule.

Bear Archery

Gainesville, Florida

Provided client with a comprehensive safety and industrial hygiene audit. Audit checklists were utilized to gauge compliance with OSHA and state regulations.

Rayonier, Inc.

Baxley and Jesup, Georgia, Fernandina Beach, Florida

Comprehensive industrial hygiene services at multiple locations. Services included: air sampling, ventilation assessments, indoor environmental quality and noise assessments. Facilities include sawmills and pulp mills.

E.I. DuPont DeNemours, Inc.

Starke, Florida

Provided various industrial hygiene and safety services. Laboratory hood surveys, silica air monitoring, ceramic fiber assessments, noise assessments, respirator fit testing, and breathing air measurements were conducted.

**PROFESSIONAL EXPERIENCE -
ASBESTOS AND LEAD-BASED PAINT MANAGEMENT**

St. Johns River Water Management District

Eustis, Florida

Performed asbestos and lead-based paint assessments for 35 buildings with a total of about 300,000 ft². The project was performed on a compressed time schedule to meet the requirements of land purchasing by the District. Recommendations for abatement were made and costs were calculated for remediation.

Atlanta Testing and Engineering

Jacksonville, Florida

Provided licensed asbestos consultant (LAC) services during City of Jacksonville LaVilla Redevelopment Project. The project team completed surveys of 100 buildings in the area.

Peoples Gas Systems, Inc.

Tampa, Florida

Prepared and presented an Asbestos Awareness course for Peoples Gas Systems' (PGS) safety professionals and installation supervisors. The course included 35-mm slides and color overheads, which will be used by PGS for future in-house training.

Rayonier, Inc.

Fernandina Beach, Florida

Managed large lead paint removal program in a pulp and paper facility. Tasks included air monitoring, preparation of specifications and observation of abatement activities. The containment for the operation included a negative pressure chamber suspended from roof trusses.

University of Florida, TREEO Center

Gainesville, Florida

Provided instruction and overall management of three different lead abatement courses. The courses included Lead Abatement Supervisor, Inspection for Lead, and Lead Risk Assessment.

Asbestos Consultation at Tampa International Airport

Tampa, Florida

This project involves an asbestos survey of the entire airport, and air monitoring of in-place friable asbestos. An O&M plan has been completed for all areas of the airport containing asbestos. Managed the removal of more than 400,000 square feet of friable asbestos valued at more than \$3 million in construction costs. The design of these projects was extremely complex and involved building working platforms under which baggage handling vehicles traveled while asbestos abatement occurred above. Operations at the airport continued with minimal disruption by using a dual barricade system, construction barriers with secondary asbestos-tight enclosures.

United States Postal Service

Various Locations, Florida

This project includes surveys of existing facilities, preparation of a report with findings, recommendations; contract bid documents, field administration, bulk sampling and air sampling for asbestos fibers on a work order-basis.

Hillsborough County School Board

Tampa, Florida

The school district is one of the largest in the country with more than 12,000,000 ft² of area in 167 schools. Services included complete surveys; specification and plan development; training; PCM, TEM, and PLM analyses; and abatement contractor selection.

Lawrence A. (Larry) Kapustka



Education: Ph.D., Botany, Plant Physiological Ecology, University of Oklahoma, Norman, OK, 1975
M.S., Botany, Plant Physiological Ecology, University of Nebraska-Lincoln, NE, 1972
B.S. Ed. Biology, University of Nebraska-Lincoln, NE, 1970

Affiliations: (ASTM) American Society for Testing and Materials
(ESA) Ecological Society of America
(IALE-US) International Association of Landscape Ecology
(SETAC) Society for Environmental Toxicology and Chemistry
(SRA) Society for Risk Analysis

Experience:

2005 to date	Golder Associates <i>Associate; Senior Ecotoxicologist</i> Responsible for advancing the state of the science in ecological risk assessment (especially spatially explicit approaches), environmental management decision approaches, and ecological valuation methods. This is to be accomplished on projects as value-added activities with current clients and identifying new clients; mentoring members of project teams; and development instructional materials for Golder University and Golder Institute.	Calgary, Alberta
1990 to 2005	ecological planning and toxicology, inc. <i>Senior Ecotoxicologist, President</i> Responsibilities included strategic planning, management, and performance of projects involving ecological risk assessment, terrestrial plant and invertebrate toxicity tests, Natural Resource Damage Assessments, toxicity test protocol development, and field surveys. Responsibilities also included scientific research, business development, marketing, and business operations.	Corvallis, Oregon
1988 to 2000	U.S. Environmental Protection Agency <i>Research Ecologist, GM-14, Team Leader of the Plant Toxicology and Hazardous Waste Teams</i> Responsibilities included planning, budgeting, and managing the research focused on characterization of plant physiological and ecological responses to xenobiotic chemicals, development of ecological risk assessment methods, development of ecological/toxicological assessment approaches and methods for hazardous waste sites, and providing technical assistance to the Environmental Protection Agency's Regional Superfund Offices.	Corvallis, Oregon
1978 to 1984	Miami University <i>Professor of Botany</i> Responsibilities related to teaching undergraduate and graduate courses in general botany, plant ecology, field ecology, and physiological ecology; advising undergraduate and graduate students; mentoring, conducting research in physiological ecology, microbial ecology, restoration ecology, and systems ecology.	Oxford, Ohio
1975 to 1978	University of Wisconsin-Superior <i>Academic Staff</i> Responsibilities included teaching undergraduate courses in ecology, forestry, and plant physiology, advising undergraduate students; conducting research in applied plant ecology related to the role of vegetation in controlling erosion.	Superior, Wisconsin

Lawrence A. (Larry) Kapustka



SELECTED PROJECT EXPERIENCE

American Cyanamid

Kapustka led a team of scientists that provided comprehensive reviews of data packages for new and existing pesticides from 1992 through 1998. The reviews included evaluation of toxicity, exposure, intended use scenarios, fate and transport, and risk to non-target species. The assessments integrated laboratory and field toxicity data with residue chemistry and biochemical markers of exposure to develop a comprehensive assessment of risks to fish and wildlife.

Rohm & Haas

Kapustka led a team of scientists that reviewed data in 1994 from laboratory toxicity tests performed to address regulatory triggers associated with intended use of a new pesticide. The evaluation focused on data quality, interpretation, and implication of data relative to the pesticide registration process.

CIBA-GEIGY

Kapustka led a team of scientists that reviewed data in 1991 through 1994 from toxicity tests and field studies conducted to support registration of pesticides. Our reviews were organized to address concerns related to the evaluation of ecological risk. The risk assessment integrated biologically relevant aspects of pesticide use scenarios, application rates, fate and transport, hazard, and exposure.

Rhone-Poulenc

Kapustka led a team of scientists that prepared an ecological risk assessment in 1992 contributing to the chemical registration process. The risk assessment integrated biologically relevant aspects of fate and transport, hazard of chemicals, and exposure for presentation to the U.S. EPA regulatory offices.

US EPA Arctic Program Organochlorine Database

Kapustka directed a team of experts in performing a quality control evaluation of analytical data quantifying organochlorines in soils and vegetation collected from the Arctic Circle. Following the recalculation of blanks, standards, and duplicates, all data were reviewed and flags assigned as appropriate; compiled all data into an ACCESS[®] Database to facilitate further studies using these data.

International Copper Association – Copper in Terrestrial Systems

Kapustka led a team of scientists that searched the literature for all information pertaining to terrestrial effects of copper in soil, both laboratory and field studies. Over 350 articles were obtained and reviewed. A summary document was produced, detailing the mechanisms of toxicity, endpoints and responses measured in laboratory studies, field verification of laboratory results, and any other information pertaining to copper. While soil benchmarks were not developed, at the express request of the client, general effects ranges were described. Future research needs were recommended and prioritized. This was submitted in 1998.

Chemical Manufacturers Association – Phthalate Esters

Kapustka led a team of scientists that reviewed all literature available in 1998 on terrestrial toxicity effects of phthalate esters (plants, soil invertebrates, and wildlife), with a particular focus of determining which ones have information suitable for use in ecological risk assessments.

Chemical Manufacturers Association – Ecological Methods

Kapustka led a team of scientists that developed a search strategy and collected information from the literature and text books on methods and their applications to ecological risk assessment. All papers were read, coded in regard to category of method, applicable biome, and other ecologically relevant topics as well as in terms of difficulty to perform, time and cost of effort, and acceptability of the approach. Nearly 2,000 records were generated from over 300 references. These were entered into a Microsoft Access database, which was given to the client as a PC accessible CD-ROM in 1997.

Lawrence A. (Larry) Kapustka



International Zinc Association

Kapustka was on a team of scientists that the International Zinc Association (IZA) had the industry lead in responding to the European Union's environmental risk assessment of zinc; conducted for IZA a review in 1997 of data and approaches used to estimate effects of zinc to plants and soil invertebrates and development of soil threshold values for use in the risk assessment. This included a review of the literature not used by the Dutch in their documentation as well as a critique of the particular studies that were used. Laboratory to field verification of selected thresholds also was being reviewed.

US EPA Ecological Soil Screening Level (Eco-SSL) Development – American Petroleum Institute

Kapustka was involved in early scoping discussions with EPA (1999 – 2002) that led to the development of protocols to conduct literature searches, reviews, and evaluation of technical content for use in setting Ecological Soil Screening Levels. He was a key participant in the review process that set SSLs for plants and invertebrates. In addition, he led a team of scientists that followed the SSL Protocols to establish SSLs for plants, invertebrates, birds, and mammals for the 16 common PAH analytes. Finally, on this project Kapustka led a team of scientists that wrote a review paper on approaches used in various jurisdictions to set Soil Protective Values.

Chemical Manufacturers Association - Plant Uptake and Terrestrial Food Web Models

Kapustka led a team of scientists (2000 – 2002) that conducted a thorough literature review on Plant Uptake and Terrestrial Food Web Models to identify research priorities that might improve the technical capacity of conduct ecological risk assessments of terrestrial systems.

Hudson River Ecological Risk Assessment Review

Kapustka was appointed to a special peer-review panel in 2003 for the US EPA to evaluate the quality, completeness, and adequacy of the Ecological Risk Assessment prepared for the Upper Hudson River Operable Unit. In addition to preparing a detailed report on the content of multiple reports and companion documents related to the risk assessment, the panel was convened for two public meetings to discuss first the nature and extent of work that had been performed by the assessment team, and second to deliberate among panelists regarding the quality of the risk assessment. A synthesis of panelists findings and opinions was prepared and submitted to EPA in August 2000

Resolution Copper

Tucson, Arizona

Member of a select science advisory panel appointed by Rio Tinto to work with Resolution Copper and its other contractors to assist with the development of methods and approaches in a pre-NEPA phase of activities to ensure that relevant environmental and social aspects are anticipated and addressed.

Teck Cominco (CAN)

Trail, British Columbia

Member of the Project Team and the Technical Advisory Committee providing expertise on the terrestrial and wetland components of the large-area ecological risk assessment effort.

Anderson-Calhoun

Colville, Washington

This project involves preparing an Engineering Evaluation/Cost Analysis (EE/CA) in accordance with an Administrative Order of Consent (AOC) between the Workgroup (The Goldfield Corporation, Blue Tee Corp. and Combustion Engineering, Inc.) and the United States Environmental Protection Agency (USEPA). The project is under the direction of Doug Morell (Golder, Redmond, WA). Kapustka is responsible for the streamlined ecological risk assessment component. The applicable regulations for the site include the State of Washington's Model Toxics Control Act (MTCA).

Lawrence A. (Larry) Kapustka



Teck Cominco (US)

Pend Oreille, Washington

Kapustka is advising the Project Director (Doug Morell, Golder, Redmond, WA) on wildlife risk assessment aspects of the project.

Kennecott Utah Copper Corporation,

near Salt Lake City, Utah

This project involved strategic planning of ecological risk assessment issues: developed the strategic plan and scope of work for the project. Key elements of the plan included consensus decisions on assessment endpoints; collaborated with large consulting firms, used modern approaches to field work, and sophisticated data management and interpretation in this project. The work was coordinated with Federal, State, and Local governmental Departments and Agencies having jurisdictional authority related to the project. Interaction with public interest groups occurred as part of a related Environmental Impact Statement. Three major components of the 360 km² area were characterized: Uplands of the Northern Oquirrh Mountains, Southshore wetlands, and the Great Salt Lake. Final reports on all three components were submitted to the US EPA.

Additional analyses of the field data collected during the ERA have been used to generate indices of biodiversity potential for different areas of Kennecott property. This baseline work is also being used to develop a site-wide landuse management plan.

UNEP-IETC

Shenyang, People's Republic of China

Under contract with the United Nations Environmental Programme – International Environmental Technology Centre (UNEP-IETC), Kapustka drafted the first Environmental Profile for the municipality and assisted with development of the Shenyang Sustainable Cities Project Document for the Shenyang Municipal Area, Liaoning Province, People's Republic of China. The area included the urban center of Shenyang and surrounding lands that support agriculture, grassland, forestry, and riparian areas in northeastern China totaling some 13,000 km². The human population of the Shenyang Urban Area is 6.5 million.

UNEP-IETC

Wuhan, People's Republic of China

Under contract with the United Nations Environmental Programme – International Environmental Technology Centre (UNEP-IETC), Kapustka drafted the first Environmental Profile for Wuhan, Hubei Province, People's Republic of China. The Wuhan Municipal Area supports 7 million people. Key environmental issues relate to domestic and industrial waste. The documents developed will be critical resources for planning land use activities and future economic development of the region.

SELECTED PUBLICATIONS

Kapustka, L. A., E. Eskew, J. Yocum. Plant toxicity testing to derive ecological soil screening levels for cobalt and nickel. *Environ. Toxicol. Chem.* 25 (3): 865-874.

Kapustka, L. A. 2005. Assessing ecological risks at the landscape scale: opportunities and technical limitations. *Ecology Society* 10 (2): 11. [online] URL: <http://www.ecologyandsociety.org/vol10/iss2/art11/>

ASTM. 2005. E2385-04 Standard guide for estimating wildlife exposure using measures of habitat quality. Vol. 11.05. *American Society for Testing and Materials*. Conshohocken, PA. [Author Kapustka, L. A.]

Kapustka, L. A. 2004. Wildlife habitat and ecological risk assessment: keeping the balance. *ASTM International Standardization News*, April. pp. 34-37.

Kapustka, L. A., H. Galbraith, M. Luxon, J. Yocum, and B. Adams. 2004. Predicting biodiversity potential using a modified layers of habitat model. pp. 117-138 in *Landscape Ecology and Wildlife Habitat Evaluation: Critical Information for Ecological Risk Assessment, Land-Use Management Activities, and Biodiversity Enhancement Practices*, ASTM STP 1458, L. A. Kapustka, H. Galbraith, M. Luxon, G. R. Biddinger, Eds., ASTM International, West Conshohocken, PA.

Kapustka, L. A., H. Galbraith, M. Luxon, J. Yocum, and B. Adams. 2004. Application of habitat suitability index values to modify exposure estimates in characterizing ecological risk. pp. 179-211 in *Landscape Ecology and Wildlife Habitat Evaluation: Critical Information for Ecological Risk Assessment, Land-Use Management Activities, and Biodiversity Enhancement Practices*, ASTM STP 1458, L. A. Kapustka, H. Galbraith, M. Luxon, G. R. Biddinger, Eds., ASTM International, West Conshohocken, PA.

Kapustka, L. A. 2003. Establishing Eco-SSLs for PAHs: lessons revealed from a review of literature on exposure and effects to terrestrial receptors. *Human Ecol. Risk Assess.* 10: 185-203.

Kapustka, L. A. 2003. Do PAHs pose unacceptable ecological risks to terrestrial receptors at hazardous waste sites? *Human Ecol. Risk Assess.* 10: 233-244.

Kapustka, L. 2003. Rationale for use of wildlife habitat characterization to improve relevance of ecological risk assessments. *Human Ecol. Risk Assess.* 9: 1425-1430.

Emlen, J., L. Kapustka, L. Barnthouse, N. Beyer, G. Biddinger, T. Kedwards, W. Landis, C. Menzie, W. Munns, M. Sorensen, and R. Wentsel. 2002. Ecological resource management: a call to action. *Bulletin of the Ecological Society of America* 83:269-271.

Kapustka, L. A., H. Galbraith, M. Luxon, and J. Yocum. 2001. Using landscape ecology to focus ecological risk assessment and guide risk management decision-making. *Toxicology and Industrial Health* 17: 236-246.

Williams, L. and L. A. Kapustka. 2000. Technical components of environmental management and the complex interface among the social and natural sciences. *Environ. Toxicol. Chem. Special Edition* 19: 1055-1058.

Kapustka, L. A. 1999. Microbial endpoints: the rationale for their exclusion as ecological assessment endpoints. *Human Ecol. Risk Assessment* 5: 691-696.

Lawrence A. (Larry) Kapustka



ASTM. 1999. Standard guide for conducting terrestrial plant toxicity tests. ASTM Annual Book of Standards. E1963-98. Vol. 11.05. *American Society for Testing and Materials*. Conshohocken, PA. [Author Kapustka, L. A.]

Kapustka, L. A., and W. G. Landis. 1998. Ecology: the science versus the myth. *Human Ecol. Risk Assess.* 4: 829-838.

ASTM. 1998. Standard guide for sampling terrestrial and wetlands vegetation. ASTM Annual Book of Standards. E1963-98. Vol. 11.05. *American Society for Testing and Materials*, Conshohocken, PA. [Author, Kapustka, L. A.]

Fairbrother, A., L. A. Kapustka, B. A. Williams, and R. S. Bennett. 1997. Effects-initiated assessments are not risk assessments. *Human Ecol. Risk Assess.* 3: 119-124.

Kapustka, L. A., B. A. Williams, and A. Fairbrother. 1996. Evaluating risk predictions at population and community levels in pesticide registration--hypotheses to be tested. *Environ. Toxicol. Chem.* 15: 427-431.

LeJeune, K., H. Galbraith, J. Lipton, and L. A. Kapustka. 1996. Effects of metals and arsenic on riparian communities in southwest Montana. *Ecotoxicol.* 5: 297-312.

Kapustka, L. A. 1996. Plant ecotoxicology: The design and evaluation of plant performance in risk assessments and forensic ecology. pp. 110-121 In La Point, T. W., F. T. Price, and E. E. Little, eds. *Environmental Toxicology and Risk Assessment: Volume 4, ASTM STP 1262*. American Society for Testing and Materials, Conshohocken, PA.

Kapustka, L. A., J. Lipton, H. Galbraith, D. Cacela, and K. LeJeune. 1995. Laboratory phytotoxicity studies: metal and arsenic impacts to soils, vegetation communities, and wildlife habitat in southwest Montana uplands contaminated by smelter emission. *Environ. Toxicol. Chem.* 14: 1905-1912.

Fairbrother, A., L. A. Kapustka, B. A. Williams, and J. Glicken. 1995. Risk Assessment in practice: success and failure. *Human Ecol. Risk Assess.* 1: 367-375.

Shirazi, M. A., M. L. Robideaux, L. A. Kapustka, J. J. Wagner, and M. C. Reporter. 1994. Cell growth in plant cultures: an interpretation of the influence of initial weight in cadmium and copper toxicity tests. *Arch. Environ. Contam. Toxicol.* 27: 331-337.

Kapustka, L. A. 1993. Chlorophyll fluorescence: its status and future as a non-intrusive assay of plant stress. pp 123-133 In Gorsuch, J. W., F. J. Dwyer, C. B. Ingersoll, and T. W. La Point, eds. *Environmental Toxicology and Risk Assessment: Volume 2 ASTM STP 1216*. American Society for Testing and Materials. Conshohocken, PA.

Arnold, P. T., and L. A. Kapustka. 1993. Comparative uptake kinetics and transport of cadmium and phosphate in *Phleum pratense*-*Glomus deserticum* associations. *Environ. Toxicol. Chem.* 12: 177-186.

Kapustka L. A., and B. A. Williams. 1991. The conceptual basis for assessing ecological risk from incineration facilities. *Proceedings of the 84th Air and Waste Management Association Meeting and Exhibition*, Vancouver, British Columbia. 91-132.2: 12.

Kapustka L. A., and B. A. Williams. 1991. Putting ecology in environmental remediation: the strategic planning process. Pages 443-446. *Proceedings on Environmental Remediation - '91*. US Department of Energy, Richland, WA.

Nwosu, J. U., H. C. Ratsch, and L. A. Kapustka. 1991. A method for on-site evaluation of phytotoxicity at hazardous waste sites. pp 333-340 In Gorsuch, J. W., W. R. Lower, and K. R. St. John, (eds.) *Plants for*

Lawrence A. (Larry) Kapustka



Toxicity Assessment, Volume 2 ASTM STP 1115. American Society for Testing and Materials, Conshohocken, PA.

Reporter, M., M. Robideaux, P. Wickster, J. Wagner, and L. A. Kapustka. 1991. Ecotoxicological assessment of toluene and cadmium using plant cell cultures. pp 240-249 In Gorsuch, J. W., W. R. Lower, and K. R. St. John, (eds.) *Plants for Toxicity Assessment, Volume 2 ASTM STP 1115*, American Society for Testing and Materials, Conshohocken, PA.

Shimabuku, R. A., H. C. Ratsch, C. M. Wise, J. U. Nwosu, and L. A. Kapustka. 1991. A new plant life-cycle bioassay for assessment of the effects of toxic chemicals using rapid cycling *Brassica*. pp. 365-375 In Gorsuch, J. W., W. R. Lower, and K. R. St. John, (eds.). *Plants for Toxicity Assessment, Volume 2 ASTM STP 1115*. American Society for Testing and Materials, Conshohocken, PA.

Kapustka, L. A., G. Linder, and M. Shirazi. 1990. Quantifying effects in ecological site assessments: biological and statistical considerations. pp. 119-133 In Lacayo, H., R. J. Nadeau, G. P. Patil, and L. Zaragoza, (eds.) *Proceedings of the Workshop on Superfund Hazardous Waste: Statistical Issues in Characterizing a Site*. Center for Statistical Ecology and Environmental Statistics, Pennsylvania State University, University Park, PA.

Kapustka, L. A., and K. G. Wilson. 1990. Influence of soybean planting density on dinitrogen fixation and yield. *Plant Soil* 129: 145-156.

Kapustka, L. A. 1990. Dinitrogen fixation in central north American prairies. pp. 481-486 in H. Yang (ed.) *Proceedings of the International Symposium on Grassland Vegetation*. Science Press, Beijing, People's Republic of China.

Murphy, T. A., and L. A. Kapustka. 1990. Capabilities and limitations of approaches to in situ ecological evaluation. pp 259-268 in Sandhu, S. S., W. R. Lower, R. J. de Serres, W. A. Suk, and R. R. Tice, eds. *Proceedings of the In Situ Evaluation of Biological Hazards of Environmental Pollutants*. Plenum Publ. Corp.

Eisele, K. A., D. S. Schimel, L. A. Kapustka, and W. J. Parton. 1989. Effects of available P and N: P ratios on non-symbiotic dinitrogen fixation in tallgrass prairie soils. *Oecologia* 79: 471-474.

Linder, G., J. C. Greene, L. A. Kapustka. 1989. Toxicity evaluations for hazardous waste sites: an ecological assessment perspective. *Proceedings of the Fifth Annual Symposium on Waste Testing Quality Assurance*. USEPA/ACS.

Kapustka, L. A., and G. Linder. 1989. Hazardous waste site characterization utilizing in situ and laboratory bioassessment methods. pp. 85-93 in Davis, W. S., and T. P. Simon, eds. *Proceedings of the Region 5 Midwest Pollution Control Biologists Meeting*. USEPA. EPA-905-89-007, Chicago, IL.

Davidson, D. W., L. A. Kapustka, and R. G. Koch. 1989. The role of plant root distribution and strength in moderating erosion of red clay in the Lake Superior watershed. *Trans. Wisc. Acad. of Sci., Arts, Letters* 77: 51-63.

Kapustka, L. A., L. C. Morrison, and J. J. DuBois. 1988. Dinitrogen fixation in the wet meadows and emergent zones of two Nebraska Sandhills lakes. *Amer. Midl. Nat.* 120: 398-404.

Arnold, P. T., and L. A. Kapustka. 1987. VA mycorrhizal colonization and spore populations in an abandoned agricultural field after five years of sludge application. *Ohio J. Sci.* 87: 112-14.

Kapustka, L. A., and J. D. DuBois. 1987. Dinitrogen fixation by cyanobacteria and associative rhizosphere bacteria in the Arapaho Prairie in the Sand Hills of Nebraska. *Amer. J. Bot.* 74: 107-113.

Lawrence A. (Larry) Kapustka



Huffman, M. R., A. E. Annala, P. T. Lattimore, and L. A. Kapustka. 1986. Prairie restorations in southwestern Ohio: vegetation and soil characteristics after ten years. pp. 185-189 in Clambey, G. K., and R. H. Pemble, eds. *Proceedings of the 9th North American Prairie Conference*. Fargo, ND.

Morrison, L. C., J. D. DuBois, and L. A. Kapustka. 1986. The vegetational response of a Nebraska Sand Hills grassland to a naturally occurring fall burn. *Prairie Natur.* 18: 179-184.

Kapustka, L. A., P. T. Arnold, and P. T. Lattimore. 1985. Interactive responses of associative diazotrophs from a Nebraska Sand Hills grasslands. pp. 149-158 in Fitter, A. H., D. Atkinson, D. J. Read, and M. B. Usher, eds. *Ecological Interactions in Soil*. British Ecological Society Special Publication No. 4, Blackwell Scientific Publications, London.

DuBois, J. D., K. R. Roberts, and L. A. Kapustka. 1984. Polyphosphate Body and acid phosphatase localization in *Nostoc* sp. *Can. J. Microbiol.* 30: 8-15.

DuBois, J. D., and L. A. Kapustka. 1983. Freeze-recovery physiology of nitrogenase activity in terrestrial *Nostoc* sp. colonies. *Applied Environ. Microbiol.* 46: 773-778.

Annala, A. E., and L. A. Kapustka. 1983. Photographic history of forest encroachment in several relict prairies of the edge of Appalachia Preserve System, Adams County, Ohio. *Ohio J. Sci.* 83: 109-114.

Younger, P. D., and L. A. Kapustka. 1983. $N_2(C_2H_2)$ ase activity by *Alnus incana* spp. *rugosa* (Betulaceae) in the northern hardwood forest. *Amer. J. Bot.* 70: 30-39.

DuBois, J. D., and L. A. Kapustka. 1983. Biological Nitrogen influx in an Ohio relict prairie. *Amer. J. Bot.* 70: 8-16.

Annala, A. E., J. D. DuBois, and L. A. Kapustka. 1983. Prairies lost to forests: A 33-year history of two sites in Adams County Ohio. *Ohio J. Sci.* 83: 22-27.

Annala, A. E., and L. A. Kapustka. 1982. The microbial and vegetational response to fire in the Lynx Prairie Preserve, Adams County, Ohio. *Prairie Natur.* 14: 101-112.

Kapustka, L. A., and J. D. DuBois. 1982. Legume distribution and nodulation in Arapaho Prairie, Arthur County, Nebraska. *Prairie Natur.* 14: 1-5.

Kapustka, L. A. 1982. The significance of asymbiotic dinitrogen fixation in grasslands. pp 157-163. In Kucera, C. (ed). *Proceedings of the 7th North America Prairie Conference*. Southwest Missouri State University, Springfield, MO

Kapustka, L. A., A. E. Annala, and W. C. Swanson. 1981. The Peroxidase-Glucose Oxidase System: A New Method to Determine Glucose Liberated by Carbohydrate Degrading Soil Enzymes. *Plant Soil* 63: 487-490.

DuBois, J. D., and L. A. Kapustka. 1981. Osmotic stress effects on the $N_2(C_2H_2)$ ase activity of aquatic *Cyanobacteria*. *Aquatic Bot.* 11: 11-20.

Kapustka, L. A., and R. G. Koch. 1980. Historical patterns in the vegetation of Wisconsin's Lake Superior shoreline. *Bull. Wisc. Bot. Club* 12: 6-9.

Younger, P. D., R. G. Koch, and L. A. Kapustka. 1980. Allelochemic interference by quaking aspen leaf litter on selected herbaceous species. *For. Sci.* 26: 429-434.

Lawrence A. (Larry) Kapustka



- Kapustka, L. A., and R. G. Koch. 1979. The acceleration of succession of a birch-maple forest due to high wind. *Mich. Bot.* 18: 83-87.
- Kapustka, L. A., and E. L. Rice. 1978. Symbiotic and asymbiotic N₂-fixation in a Tall Grass Prairie. *Soil Biol. Biochem.* 10: 553-554.
- Kapustka, L. A., and E. L. Rice. 1978. Acetylene reduction (N₂-fixation) of glucose-amended soils from central Oklahoma old field succession plots. *Southwest Natur.* 23: 389-396.
- Koch, R. G., L. A. Kapustka, and L. M. Koch. 1977. Presettlement vegetation of the Nemadji River Basin. *Minn. Acad. Sci.* 43: 19-23.
- Kapustka, L. A., and E. L. Rice. 1976. Acetylene reduction (N₂-fixation) in soil and old field succession in central Oklahoma. *Soil Biol. Biochem.* 8: 497-503.
- Kapustka, L. A., and J. R. Rosowski. 1976. The response of a *Cylindrospermum* species to different sources of nitrogen. *Proc. Okla. Acad. Sci.* 56: 49-52.
- Kapustka, L. A., S. V. Bermudez, T. Morrison, and R. Wingo. 1976. Chemical and biological analysis of a hazardous waste disposal site. *Proc. Okla. Acad. Sci.* 56: 42-48.
- Kapustka, L. A., and F. L. Moleski. 1976. Changes in community structure in Oklahoma old field succession. *Bot. Gaz.* 137: 7-10.

Audrey Wagenaar



Education: M.Sc., Medicinal Chemistry, University of Sussex, U.K. 1992.
B.Sc., Combined Honours Chemistry and Biology, University of British Columbia, Vancouver, B.C. 1990.

Affiliations: American Chemical Society
Society for Risk Analysis
Society for Environmental Toxicology and Chemistry

Experience:

2004-Present **Golder Associates** **North Vancouver, BC**
Senior Environmental Scientist
Responsibilities include conducting human health risk assessments, managing and providing senior review for ecological risk assessments; business development and marketing.

2002-2004 **EVS Environment Consultants** **North Vancouver, BC**
Senior Environmental Scientist
Responsibilities included conducting human health risk assessments, managing and providing senior review for ecological risk assessments; business development and marketing.

2001-2002 **Golder Associates** **Mississauga, ON**
Senior Risk Assessor/Toxicologist
Responsibilities included conducting site-specific risk assessments and developing remediation criteria; peer review of site-specific risk assessments; developing chemical-specific toxicological criteria; providing expert advice on potential health effects based on toxicological information; project management; and risk communication.

1999-2001 **Ontario Ministry of the Environment** **Toronto, ON**
Senior Regulatory Toxicologist
Responsibilities included providing expert advice for community-based risk assessments; developing provincial air standards; reviewing site-specific risk assessments; and risk communication.

1997-1999 **Eastern Research Group** **Boston, USA**
Environmental Scientist
Responsibilities included providing technical advisory services to various government and corporate clients in the areas of human health risk assessment; ecological risk assessment; medicinal chemistry; and database development.

1993-1997 **Environment Canada** **North Vancouver, BC**
Toxic Substances Evaluation Scientist/ Controls Program Officer
Responsible for evaluating the environmental toxicology of chloramine - a drinking water disinfectant - under the Priority Substance List (PSL) of Canadian Environmental Protection Act (CEPA). Project involved collecting chloramine-related toxicological data, development of a Microsoft Access database, evaluation of data and data quality, and determination of appropriate assessment endpoints. In addition, general advisory and consulting services in the area of toxicology were provided to senior management, other departmental scientists, federal/ provincial agencies, industry and the general public.

CERTIFICATION AND CONTINUED TRAINING

Probabilistic Risk Assessment, Harvard School of Public Health, Cambridge, Massachusetts, September 2000.

Expert Witness Training, Ontario Ministry of the Environment, Toronto, Ontario, June 2000.

Fourth International Conference on Arsenic Exposure and Health Effects, The Society of Environmental Geochemistry & Health, San Diego, California, June 2000.

Crystal Ball – Probabilistic Risk Assessment Software Training, Toronto, Ontario, March 1999.

Human Health and Ecological Risk Assessment, SENES Consultants and Oak Ridge National Laboratories, Vancouver, British Columbia, June 1994.

SLECTED PROJECT EXPERIENCE – HUMAN HEALTH RISK ASSESSMENT

Public Health Risk Assessment for Superfund Site -

Marine Corps Logistics Base Barstow

Barstow, California

Scientist responsible for preparing the human health risk assessment of a drinking water supply containing elevated levels of trichloroethene, vinyl chloride, and *cis*-1,2-dichloroethene at Marine Corps Logistics Base, Barstow, California. The risk assessment was prepared for the US Agency for Toxic Substances and Disease Registry (ATSDR) and addressed both on- and off-Site impacts of the chlorinated solvents. The health risk assessment involved extensive communication with ATSDR and U.S. Marine Corps officials.

Public Health Risk Assessment for Superfund Site -

Mountain Home Air Force Base

Mountain Home, Idaho

Scientist responsible for preparing the human health risk assessment of a drinking water supply containing elevated levels of trichloroethene at Mountain Home Air Force Base, Mountain Home, Idaho. The risk assessment was prepared for the US Agency for Toxic Substances and Disease Registry (ATSDR) and involved consultation with ATSDR and U.S. Army officials.

Human Health Risk Assessment – Recreational Water Use

Canadian National Railway Company

Wabamun, AB

Principal human health risk assessor responsible for risk assessment of sediment and surface water impacted by an oil spill into a large freshwater recreational lake, as the result of a train derailment. The primary contaminants of concern were PAHs, novel alkylated PAHs and selected VOCs. The risk assessment involved the development of toxicity reference values for alkylated PAHs, as well as complex peer review and multi-stakeholder consultation process. The results were presented to the local medical officer of health, who subsequently removed the non-water use advisory for recreational purposes.

Development of Toxicity Reference

Values - Pfizer

North Haven, Connecticut

Principle toxicologist responsible for evaluating and/or developing toxicity reference values for 38 novel substances found in soil, groundwater, and surface water at a former chemical manufacturing site. The site is undergoing a RCRA evaluation in consultation with state government. The evaluation process included determining whether toxicity reference values (TRVs) were available for a substance, conducting a comprehensive literature search to obtain current toxicological information for the substances and then assessing the non-carcinogenic, carcinogenic and mutagenic effects of the substances. The assessment also involved application of modifying factors to account for potential mutagenicity and carcinogenicity to existing reference values and developing oral and inhalation reference doses for chemicals which currently lack toxicity reference values. Toxicity profiles were prepared to document the assessment of each substance and provide a rationale for selection/derivation of TRVs for each substance. The TRVs were subsequently utilized to develop site-specific risk-based cleanup standards for these substances.

Risk Assessment of the Impact of Stormwater Run-off from a

Copper Mine on Vegetable Gardens of a Native American Reservation

Arizona

Risk assessor responsible for determining potential impact of human consumption of vegetables irrigated with stormwater run-off containing elevated levels of metals from a copper tailings area. Risk assessment was prepared for the Agency of Toxic Substances and Disease Registry (ATSDR) and involved consultation with ATSDR and the local Native American government.

Human Health Risk Assessment of

Former Plant Nursery Operations – NOAA and Ridolfi Engineers Washington, DC

Principle human health risk assessor responsible for a multimedia risk assessment of a 44-acre former plant nursery operations located in Washington DC. The site will be redeveloped into a passive recreational park within the US National Park system and will include a sensitive wetland area. Primary contaminants of concern included in the assessment were metals, PAHs, PCBs and pesticides, which are currently found in site soils, sediment, groundwater, and surface water. The risk assessment was conducted to CERCLA standards and involved a complex multistakeholder (NOAA, Architect of the Capital, EPA and District of Columbia Department of Health) and regulatory review process.

Head Technical Report – Human Health Risk Assessment

Port of Melbourne Corporation

Melbourne, Australia

Principle scientist responsible for planning, management and conducting a detailed quantitative human health risk assessment to assess the uptake of contaminants (metals, PAHs, and pesticides) from sediment by ecological receptors (three species of fish and mussels) as the result of proposed dredging activities in Port Philip Bay, Melbourne, Australia and the subsequent consumption of these fish and mussels by recreational and subsistence fisher populations. Responsibilities included providing direction for data screening, problem formulation and food chain modeling as well as conducting the HHRA, report writing, quality assurance/control, and management of budget, scope, timelines and staff resources as well as client liaison.

Human Health Risk Assessment –Lead-Zinc Mine Tailings

The World Bank and GeoConsult Engineers

Mojkovac, Montenegro

Principle human health risk assessor responsible for a multimedia screening level risk assessment of the tailings management facility adjacent to the community of Mojkovac, Montenegro. Although capped, portions of the tailings are flooded and have been used for recreational purposes including fishing and swimming. The multimedia screening level risk assessment will be used to assist the World Bank in addressing the community issues and risk management options.

Site-Specific Human Health and Ecological Risk Assessment

Former Power Stations - Ontario Power Generation Inc.

Niagara Falls, ON

Principle human health risk assessor responsible for conducting a site-specific human health and ecological risk assessment of a two former historic hydroelectric power stations that will potentially be redeveloped as museums or for other public use. The primary contaminants of concern were metals, petroleum and polycyclic aromatic hydrocarbons in soils. Risks were assessed for future residential users as well as maintenance and construction workers.

Site-Specific Human Health and Ecological Risk Assessment

Former Landfill - Claridge Homes Corporation

Ottawa, ON

Principle human health risk assessor responsible for conducting a site-specific human health and ecological risk assessment of a former landfill and salt storage site that is being redeveloped for residential and parkland use. The primary contaminants of concern were metals and polycyclic aromatic hydrocarbons in soil. Site-specific metal bioaccessibility in soil was used in the exposure calculations. Risks were assessed for future residential users as well as maintenance and construction workers.

Screening-Level Risk Assessment, Commercial Office Tower

Royal Bank of Canada and EBA Consulting Engineers

Vancouver, BC

Human health risk assessor responsible for conducting a human health risk assessment of a commercial office tower constructed on the site of a former drycleaner operation. The risk assessment was conducted to determine potential risks to building users and off-site receptors resulting from elevated concentrations of tetrachloroethene present in site groundwater.

Human Health Risk Assessment – Impact of Landfill Leachate

On Drinking Water Supply - District of Mission

Mission, BC

Principal human health risk assessor responsible for risk assessment of a community drinking water supply and recreational swimming area impacted by landfill leachate runoff as the result of a severe rainfall event. The primary contaminants of concern were metals, PAHs, PCBs, pesticides and dioxin/furans. The results were presented to the local medical officer of health, who subsequently removed the non-water use advisory for drinking water and recreational purposes.

Development of the Draft Uranium Air Standard

Ontario Ministry of the Environment

Ontario

Co-author of the provincial uranium air standard based on the chemical toxicity specific to exposures in a community adjacent to a uranium refinery (Pt. Hope, Ontario). The uranium air standard was set to ensure that unacceptable levels of uranium did not accumulate in soil and utilized a multimedia approach. The development of the uranium standard involved extensive communication and consultation with the local medical officer of health, industrial stakeholders, local government and public interest groups.

Update of the Canadian National Contaminated Sites (NCS)

Classification System

Canadian Council for Ministers of the Environment

Ottawa, ON

Project manager and principle scientist involved in updating the existing NCS classification system which is used to rank federal sites. The updated NCS is currently under review on the CCME website, and once approved will be used by all consultants working on federal sites to standardize prioritization for funding and action. Primary changes included the reduction of ambiguity to assist in the standardization of responses, improved clarity and incorporation of additional technical scoring such as northern specific issues.

Finalization of Clean-up Criteria

Port Hope Low Level Radioactive Waste Management Office

Port Hope, ON

Co-author of an assessment of cleanup criteria for non-radiological contaminants to be used in an Ontario community that had been historically impacted by uranium metal processing. This project involved the critical assessment of exposure models used in Ontario and other jurisdictions to derive risk-based cleanup criteria and determined the suitability for use in this community. A site-specific multimedia approach was recommended for several contaminants of concern.

Screening-Level Risk Assessment, Active Drydock

Vancouver Port Authority

Vancouver, BC

Senior risk assessor responsible for conducting a human health risk assessment of an active drydock and associated property for purposes of a land transaction. The risk assessment was conducted to determine potential health risks to drydock and construction workers as well as site trespassers to elevated concentrations of petroleum hydrocarbons and metals in site soils and groundwater.

Preliminary Quantitative Risk Assessment

Defense Construction Canada

Bedford, NS

Senior human health risk assessor responsible for conducting a preliminary quantitative human health risk assessment of a former landfill at a former dredgeate disposal facility at the Canadian Forces facility. The risk assessment was conducted to determine risks to commercial and construction workers resulting from elevated concentrations of metals and polycyclic aromatic hydrocarbons in soil and sediment. The report was used to obtain funding under the Federal Contaminated Sites Action Plan for further work.

Screening-Level Risk Assessment, Application of Coal Tar Enamel

Greater Vancouver Regional District

Vancouver, BC

Senior risk assessor responsible for conducting a human health risk assessment related to inhalation of PAHs, particulates and VOCs as the result of application of coal tar enamel to large diameter water pipes that are being placed through a series of residential neighbourhoods. The risk assessment was conducted to determine potential health risks to construction workers and nearby residents.

Site-Specific Risk Assessment of a Former Iron

Pigments Manufacturing Facility - Elementis Pigments

Etobicoke, ON

Senior toxicologist responsible for conducting a site-specific risk assessment to determine the potential for adverse health impact to site users exposed to elevated metals concentrations in soil. A site-specific soil remedial criterion was developed for iron. The project also involved significant interaction with legal council for the former facility.

Screening-Level Risk Assessment, Public Storage Facility

Public Storage Canada

Vancouver, BC

Human health risk assessor responsible for conducting a human health risk assessment of a public storage facility constructed on a former commercial/industrial sited. The risk assessment was conducted to determine potential risks to building users and off-site receptors resulting from elevated concentrations of concentrations of petroleum hydrocarbons in groundwater and lead in soil.

Screening-Level Risk Assessment of a

Manufacturing Facility

Confidential

Human health risk assessor responsible for conducting a human health risk assessment of a manufacturing facility which was potentially impacted by a historic spill of chlorinated solvents. The risk assessment was conducted to determine potential risks to building users and construction workers associated with inhalation indoor and outdoor air as the result of the subsurface vapour intrusion resulting from elevated concentrations of chlorinated solvents in site soils and groundwater.

Screening-Level Risk Assessment, Church

Grace Presbyterian Church

Vancouver, BC

Human health risk assessor responsible for conducting a human health risk assessment of a church and underground parking garage in adjacent commercial building impacted by a historic fuel oil spill. The risk assessment was conducted to determine potential risks to building users and off-site receptors resulting from elevated concentrations of petroleum hydrocarbons and polycyclic aromatic hydrocarbons present in site soil.

Screening-Level Risk Assessment

**Former Corrections Camp - British Columbia Building Corp.
and Morrow Environmental Consultants Inc.**

Alouette Lake, BC

Senior risk assessor responsible for conducting a human health risk assessment of a former corrections camp on the shore of Alouette Lake which had been the site of fuel storage leak. The future site use is a proposed recreational camp for children. The risk assessment was conducted to determine potential risks to building users resulting from elevated concentrations of residual petroleum hydrocarbons present below several residential buildings on-site.

PROJECT RELATED EXPERIENCE - ECOLOGICAL RISK ASSESSMENT

Terrestrial and Groundwater Ecological Risk Assessments South East False Creek

Vancouver, BC

Project manager for terrestrial and groundwater ecological risk assessments of a former industrial site scheduled for redevelopment for the 2010 Winter Olympic Athletes Village and later for use as a mixed residential and urban park property. Contaminants of potential concern included elevated concentrations of metals and PAHs in soil and groundwater. Responsibilities included providing direction and design of assessments, overseeing data analysis and food chain modeling and overall responsibility for report writing.

Ecological Risk Assessment of a Former Sawmill site

Vancouver, BC

Project manager for terrestrial and aquatic groundwater ecological risk assessments of metals and chlorophenols at a former sawmill site adjacent to the Fraser River. Responsibilities included providing direction and design of assessments, overseeing data analysis and food chain modeling and overall responsibility for report writing.

**Ecological Risk Assessment for Pt. Atkinson Lightstation and
Lighthouse Park**

West Vancouver, BC

Project manager for terrestrial and aquatic ecological risk assessments of elevated metals in soils adjacent to lightstation and in several areas of the park. Responsibilities included providing direction and design of assessments and problem formulation workshop, overseeing data analysis and food chain modeling and overall responsibility for report writing.

Ecological Problem Formulation

Tofino Airport

Tofino, BC

Project manager and senior risk assessor for terrestrial and aquatic ecological problem formulations for three former landfill sites associated with the Tofino airport. Contaminants of concern included elevated metals and petroleum hydrocarbons in site soils, groundwater, surface water and sediments. The problem formulation was presented to stakeholders for input and will be used to obtain funding under the Federal Contaminated Sites Action Plan for further work. Responsibilities included providing direction and design of problem formulation workshop, overseeing data analysis and report writing.

**Ecological Risk Assessment Policy Support for the
United States Environmental Protection Agency (US EPA)**

Washington, DC

Scientist providing technical support to the US EPA on a number of ecological risk assessment policy issues. Responsibilities included attending internal technical forums and documenting results of discussions. Topics covered included: (i) use of bioavailability in risk assessment; (ii) development of management objectives for ecological risk assessment; and (iii) use of in-place inactivation and natural ecological remediation activities for metals in soil.

Evaluation of the Environmental

Toxicology of Inorganic Chloramines

Vancouver, BC

Scientist responsible for evaluating the ecological toxicology of the drinking water disinfectant, chloramine, in accordance with the Priority Substances II List protocol. Technical tasks included collecting chloramine-related toxicological data, evaluating the data and data quality, determining that a new analytical method would need to be developed for the assessment, and selecting appropriate assessment endpoints for additional toxicity testing. Another key area of the project involved setting up a Environmental Resource Group consisting of chloramine experts from various academic, industrial and government sources to provide ongoing feedback on the technical decisions made during the evaluation. Formal oral presentations were made to the Environmental Resource Group in Ottawa and Vancouver.

Environment Canada Polycyclic Aromatic

Hydrocarbon Risk Management Workshop

Vancouver, BC

Scientist responsible for organizing a workshop to discuss risk management options for a community in Northern British Columbia impacted by industrial emissions of polycyclic aromatic hydrocarbons. Other responsibilities included facilitating summary discussions and documenting workshop proceedings. Workshop participants included industrial stakeholders and their technical consultants, government scientists and officials, and native elders from the impacted community.

PROJECT RELATED EXPERIENCE - THIRD-PARTY PEER REVIEW

Review of Site-Specific Risk Assessments

Ontario

Senior Regulatory Toxicologist responsible for reviewing site-specific risk assessments and remediation criteria to ensure compliance with the Guideline for Use at Contaminated Sites for the Ontario Ministry of the Environment. Excellent knowledge of Ontario Contaminated Sites Guidelines and the Ministry's site-specific risk assessment approval process.

Peer Review of Four Site-Specific Risk Assessments for Off-Site Impacts

Ontario

Senior Toxicologist responsible for the peer review of four site-specific risk assessments that had been conducted to determine the potential human and ecological risks originating from an industrial facility. Soil and groundwater remedial criteria were also reviewed. The primary contaminants of concern were elevated levels of chlorinated solvents such (such as trichloroethene, vinyl chloride and *cis*-1,2-dichloroethene) which have migrated in groundwater to a residential neighbourhood. The peer review was conducted in accordance with the protocol outline in the "Guidance on Site-Specific Risk Assessment for Use at Contaminated Sites in Ontario".

PROJECT RELATED EXPERIENCE - EXPERT ADVICE (TOXICOLOGY)

Technical Advisor, Human Health Risk Assessment

Wawa, ON

Senior Regulatory Toxicologist representing the Ontario Ministry of the Environment on the Wawa Technical Steering Committee. Responsibilities included guiding and critically reviewing the human health risk assessments and biological monitoring studies of a population living adjacent to soil containing elevated levels of arsenic. Regular meetings with the local medical officer of health, industrial stakeholders, local government and their technical consultants were required.

Audrey Wagenaar



Technical Advisor, Community-Based Risk Assessment,

Pt. Colborne, ON

Senior Regulatory Toxicologist representing the Ontario Ministry of the Environment in the multistakeholder development of a community-based risk assessment approach for use in Pt. Colborne, Ontario. Pt. Colborne has elevated metals concentrations in the soils in the area resulting from historical metal refining activities. Responsibilities included critically reviewing the proposed community-based approach including the framework for the human health and ecological risk assessments, potential risk management measures and implementation of these risk management measures. Risk communication at public forums and frequent interaction with the local medical officer of health, industrial stakeholders, local government and their technical consultants were required.

Provision of Expert Toxicological Advice to Ontario Medical Officers of Health

Ontario

Senior Regulatory Toxicologist responsible for providing expert toxicological advice to Ontario Medical Officers of Health on an "as-needed" basis. Projects included initiation of two blood lead screening programs for children and pregnant women exposed to lead (1) in mine tailings used for garden landscaping and paving and (2) from aerial deposition in gardens in a smelting town; and assessment of off-site odour/health issues related to remediation activities.

Ontario Ministry of the Environment Course on the Contaminated Sites Guidelines

Ontario

Key Speaker at the Ontario Ministry of the Environment's course on Contaminated Sites Guidelines for environmental consultants and municipal planners held in several locations throughout Ontario. Discussed how to conduct the human health component of a site-specific risk assessment, including best practices and technical review considerations.

CURRICULUM VITAE

January 2008

NAME: Terrance W. Cundy

TITLE: Manager – Silviculture, Wildlife and Environment

ADDRESS: Potlatch Forest Holdings, Inc
805 Mill Road
PO Box 1388
Lewiston, ID 83501

EDUCATION Ph.D. 1983 Watershed Science, Utah State University

M.S. 1980 Forest Resources with emphasis in Hydrology, University of Minnesota

B.S. 1978 Forest Resources (High Distinction), University of Minnesota

PROFESSIONAL APPOINTMENTS

2007-present Manager - Silviculture, Wildlife and Environment.

Responsibilities include management of technical team (silviculture, wildlife, and forest certification) to support operations and administrative staff in all operating units across the U.S. Ensure on-going compliance with various certification systems (ISO 14001 and FSC), manage the portfolio of research projects in timber and non-timber resources, and participate on various industry and public committees (NCASI and AFPA Committees, Idaho Forest Practices Committee, Idaho DEQ committees).

2005-present Affiliate Professor, College of Natural Resources, University of Idaho.

2004-2007 Manager, Technical Services and Environmental Management System, Potlatch Corporation – Idaho Region.

Responsibilities include management of technical services team (silviculture, wildlife, biometrics and geographic information systems) to support operations and administrative staff. Ensure on-going compliance with various certification systems (ISO 14001, SFI and FSC) as well as participate on various industry and public committees (NCASI and AFPA Committees, Idaho Forest Practices Committee, Idaho DEQ committees).

2001–2004 Manager, Environmental Management System, Potlatch Corporation – Idaho Region.

Responsibilities included development and implementation of an ISO 14001/SFI/FSC compliant environmental management system for the Idaho Region of the Resource Management Division. Served as Potlatch representative on various committees of the National Council of the Paper Industry for Air and Stream Improvement (NACSI) and American Forest and Paper Association (AFPA) as well as several state and local committees associated with state regulatory activities.

1994-2001 Resource Hydrologist, Potlatch Corporation – Idaho Region.

Responsibilities included providing technical assistance to Resource Management Unit Teams, and oversight of the Mica Creek Experimental Watershed Study. Served as Potlatch representative on various NACSI and AFPA committees as well as several state and local committees associated with state regulatory activities. Received Management Performance Award in 1999.

1994-present Affiliate Professor, College of Forest Resources and College of Engineering, University of Washington.

1983-1994 Professor, College of Forest Resources, University of Washington, Graduate Faculty 1985. Affiliate Professor in Civil Engineering 1993.

Conducted research in the areas of watershed chemical and water balances, landslides and debris flows, hillslope hydrology, runoff and erosion from rangelands, timber harvesting impacts on soils, and watershed scale modeling of hydrologic cumulative effects.

1980-1983 Research and Teaching Assistant at Utah State University.

Worked on research relating the spatial variability of point infiltration rates to watershed loss rates. Duties included full responsibility for instructing three Watershed Science courses, and organizing a watershed science seminar.

1976-1980 Research/Teaching Assistant at University of Minnesota.

Work as a Research Assistant was on "Snowmelt Modeling of Upper Missouri River Watersheds With SSARR." As a Teaching Assistant, assisted in the beginning and advanced Forest Hydrology classes. As an undergraduate, assisted various graduate students in field watershed studies.

PROFESSIONAL ACTIVITIES:

Certified Professional Forester (#3000) by Society of American Foresters since 2003.

Chair, Cumulative Effects of Forest Practices, Water Resources Working Group Session, Society of American Foresters National Convention, September 25-28, 1989.

Chair, Session: Characterization and Modeling of a Hollow in the Cascades With Respect to Slope Stability, 37th Annual Meeting of the Pacific Northwest Section, American Geophysical Union, Sept. 13-14, 1990, Seattle, WA.

Co-chair, Session: Wildland Hydrology - 1990 and Beyond, 1988 National AWRA Conference, November 6-11, 1988, Milwaukee, WI.

Co-chair, Hydrology and Erosion of Timberland Conversions in Western Washington, Workshop of the Washington State Section AWRA and Center for Streamside Studies (UW), November 15-16, 1988, Seattle, WA.

Consultant, U.S. Forest Service, Forest Sciences Lab, Logan, UT; July to October 1980.

Consultant, Los Alamos National Lab, Los Alamos, NM; July 1986-1988.

Consultant, Tacoma - Pierce County Health Dept., Tacoma, WA; 1990-1992.

Consultant, various private organizations.

Instructor, Washington State Department of Natural Resources Watershed Analysis Training, 1992, 1993.

Instructor, Hillslope Hydrology Workshop, Taiwan Forestry Research Institute, 1992.

Member, American Forest and Paper Association Wildlife Committee, since 1995.

Member, American Forest and Paper Association Aquatic Sub-committee, since 1995.

Member, American Geophysical Union since 1981.

Member, American Water Resources Association since 1978; Secretary-Treasurer, Utah State University Section, 1980-82; Chairman-Elect, Wildland Hydrology Working Group, 1987-88; Chairman, Wildland Hydrology Working Group 1989-90.

Member (Associate), American Society of Civil Engineers, since 1996.

Member, Clearwater Basin Advisory Group, since 1995.

Member, Clearwater National Forest Landslide Assessment Team, 1996-97

Member, Governor of Idaho Bull Trout Conservation Team, 1995.

Member, Idaho Forest Practices Act Advisory Committee, since 1995.

Member, IUFRO Hydrology Group 1985-1996.

Member, National Council of the Paper Industry for Air and Stream Improvement - Water Quality Steering Committee since 1994.

Member, National Council of the Paper Industry for Air and Stream Improvement - Cumulative Effects Steering Committee since 1994.

Member, Northwest Forest Soils Council 1984-1994.

Member, Society of American Foresters 1983-1994; Certified Forester #3000.

Member, Water Body Assessment Guidance Technical Review Team, Idaho DEQ, 1996.

Member, Western Snow Conference 1980-1994.

Member, Xi Sigma Pi Professional Fraternity since 1978; Secretary-Fiscal Agent for Delta Chapter 1980.

Member, Timber, Fish, Wildlife (TFW) Erosion and Sedimentation subcommittee, 1987-1988.

Member, TFW Ambient Monitoring subcommittee, 1988.
Participant, U.S. Dept. of Energy Remote Fluvial Experiments program reviews 1986-87.
Presentation (in absentia) – Western Division of American Fisheries Society Annual meeting, Anchorage, AK, 1998.
Reviewer, Forest Science
Reviewer, Journal of Range Management
Reviewer, Water Resources Bulletin
Reviewer, Water Resources Research
Speaker - Soil erosion and sedimentation short course, Cooperative Extension, Washington State University, 1984 and 1986.
Speaker - Silviculture Institute, 1984-93, College of Forest Resources, University of Washington.
Speaker - Olympic National Park NAPAP Research Conference, Olympic National Park.
Speaker - Channel morphology workshop, Center for Streamside Studies, University of Washington, 1988.
Speaker - Hillslope stability workshop, Center for Streamside Studies, University of Washington, 1988.
Speaker - Acid rain workshop, Hydrology and Soils Working Groups, Society of American Foresters Convention, 1988.
Speaker - Hydrology and erosion of timberland conversions in western Washington - workshop, American Water Resources Assoc. (WA Chapter) and Center for Streamside Studies, University of Washington, 1988.
Speaker - GIS and cumulative effects - workshop, National Council of Paper Industry for Air and Stream Improvement, Lewiston, ID, 1992.
Speaker - Stream habitat - application of geomorphic and ecological principles - workshop, Oregon State Univ. 1993.
Speaker - 10th Annual U.S. Landscape Ecology Symposium - A World Dominated by Humans: Theory and Practice, 1995. Minneapolis, MN, 1995.
Speaker - West Coast Regional Meeting, NCASI, Portland, OR, 1995.
Speaker - Upper Columbia Basin Water Resources Workshop, Coeur D'Alene, ID, 1995.
Speaker - Western Forestry and Conservation Association Meeting, Coeur D'Alene, ID, 1995.
Speaker - Idaho Chapter of American Fisheries Society Annual Meeting, Boise, ID, 1995.
Speaker - Twelfth Annual Inland Empire Forest Engineering Conference, Moscow, ID, 1995.
Speaker - Fourteenth Annual Inland Empire Forest Engineering Conference, Moscow, ID, 1997.
Speaker - Dynamics of Northern Idaho Forests, A Symposium of Plants, Animals and People, Coeur D'Alene, ID, 1996.
Speaker - West Coast Regional Meeting, NCASI, Portland, OR, 1996.
Speaker – National Meeting of the American Fisheries Society, Hartford, CT, 1998.
Speaker – National Meeting of the American Fisheries Society, St. Louis, MO, 2000.
Speaker – Forester Forum, Intermountain Forest Association, Coeur d Alene, ID, 2004.
Speaker – Forester Forum, Intermountain Forest Association, Coeur d Alene, ID, 2006.

Speaker – National Academy of Sciences ****

Student – Situational Leadership, Potlatch Corp, 1995.

Student – Personalisis, Potlatch Corp, 2001.

Student – Management Skills for New Managers, American Management Association, 2003.

Symposium Moderator - Streamside Management--Forestry and Fishery Interactions, February 12-14, 1986, University of Washington.

Watershed Analysis - certified in Watershed Analysis by Washington Department of Natural Resources, 1992.

PUBLICATIONS:

Cundy T.W. 1980. Mining and hydrology interactions--a literature review. Project Completion Report to U.S. Forest Service, Forest Sciences Lab, Logan, UT.

Cundy, T.W. 1980. Snowmelt modeling of upper Missouri watersheds with SSARR. Plan B paper. University of Minnesota, St. Paul, MN.

Cundy, T.W., Brooks, K.N. and D.S. Sveum. 1980. Snowmelt modeling of upper Missouri River watersheds with SSARR. Presented at 48th Annual Western Snow Conference, April 15-17, 1980. Laramie, WY.

Cundy, T.W. and K.N. Brooks. 1981. Calibrating and verifying the SSARR model--Missouri River watersheds study. Water Resources Bulletin, 17(5):775-782.

Hawkins, R.H. and T.W. Cundy. 1982. Distribution of loss rates implicit in the SCS runoff equation. Presented at American Geophysical Union Hydrology Days, April 21-22, 1982. Colorado State University, Fort Collins, CO.

Cundy, T.W. 1982. An analysis of the effects of spatial variability of point infiltration rates on the comparison of small and large plot rainfall-runoff. Ph.D. Dissertation. Utah State University, Logan, UT.

Grah, O.J., Hawkins, R.H. and T.W. Cundy. 1983. Distribution of infiltration on a small watershed. Presented at ASCE, Irrigation and Drainage Specialty Conference "Advances in Irrigation and Drainage: Surviving External Pressures", Jackson, WY. pp.44-54.

Cundy, T.W. 1984. The use of data logging systems in snow hydrology. Presented at 52nd Annual Western Snow Conference, April 17-19, 1984. Sun Valley, ID.

Cundy, T.W. 1985. A perspective on the fields of forest/range hydrology and its implications for undergraduate and graduate education. Presented at American Institute of Hydrology Workshop/Seminar "Educational and Professional

Development in Hydrology and Hydrogeology: Needs and Opportunities."
November 14-15, Las Vegas, NV.

- Cundy, T.W. and S.W. Tonto. 1985. Solution to the kinematic wave approach to overland flow routing with rainfall excess given by Philip's equation. *Water Resources Research*, 21(8):1132-1140.
- Cundy, T.W. 1986. An overview of erosion processes in the Pacific Northwest. Presented at 5th Biennial Soil Erosion and Sedimentation Short Course, November 5-6, 1986. Olympia, WA.
- Edmonds, R.L., T. Cundy, J.J. Rhodes and T.B. Thomas. 1986. Precipitation, throughfall and stream chemistry in a pristine watershed on the Olympic National Park, Washington. 71st Ecol. Soc. Amer. Meeting, Syracuse, New York, Aug. 10-16 (Abstract).
- Cundy, T.W. and R.H. Hawkins. 1987. Effects of spatial variability on small plot and hillslope infiltration. In: *Proceedings of the International Conference on Infiltration Development and Application* (Y. Fok, ed.), January 1987, University of Hawaii at Manoa, Honolulu, HA.
- Dunne, T., W. Zhang, and T.W. Cundy. 1987. Systematic variations in infiltration on semi-arid hillslopes. Abstract presented at IGU-IAHS Workshop on Erosion, Transport and Deposition Processes. Jerusalem, Israel. March 29-April 4, 1987.
- Hawkins, R.H. and T.W. Cundy. 1987. Steady-state analysis of infiltration and overland flow for spatially-varied hillslopes. *Water Resources Bulletin* 23(2):251-256.
- Salo, E.O. and T.W. Cundy (eds.). 1987. *Proceedings of the Symposium on Streamside Management: Forestry and Fishery Interactions*, held at the University of Washington, Feb. 12-14, 1986. Contribution No. 57, Institute of Forest Resources, University of Washington.
- Springer, E.P. and T.W. Cundy. 1987. Field-scale evaluation of infiltration parameters from soil texture for hydrologic analysis. *Water Resources Research*, 23(2):325-334.
- Thomas, T.B., R.L. Edmonds, J.J. Rhodes, and T.W. Cundy. 1987. Precipitation, interception, and stream chemistry of West Twin Creek watershed, Olympic National Park. Presented at the 60th Annual Meeting of the Northwest Scientific Association, March 26-28, Pacific Lutheran University, Tacoma, WA.
- Zhang, W. and T.W. Cundy. Test of a surface runoff and soil erosion model for forest road surfaces. IN: *Proceedings of the International Symposium on Erosion and Sedimentation in the Pacific Rim*. August 3-7 1987. Corvallis, OR.

- Zhang, W. and T.W. Cundy. 1987. A modified Einstein bed load transport equation for laminar overland sheet flow. *ASCE J. Hydraulic Eng.*, 13(12):1525-1538.
- Cundy, T.W., 1987. Contrasting hydrologic processes on semiarid and humid watersheds, summary of the presentation and discussion at the Second REFLEX Investigators' Meeting. Sept. 15-16, 1987, Lewes, DE, U.S. Dept. of Energy, Pub. DOE/ER - 0354.
- Parks, D.S. and T.W. Cundy. Soil hydraulic characteristics of a small southwest Oregon watershed following high intensity wildfire. IN: *Proceedings of the Symposium on Fire and Watershed Management* October 26-28, 1988, Sacramento, CA, USDA Forest Service, General Tech. Rep. PSW-109, pp. 63-67.
- Springer, E.P. and T.W. Cundy. The effects of spatially-varying soil properties on soil erosion. IN: *Proceedings of the ASAE International Symposium on Modeling Agricultural, Forest and Rangeland Hydrology*, December 12-13, 1988, Chicago, IL.
- Cundy, T.W. and R.H. Hawkins. 1989. A continuous distributed model of storage dominated watershed runoff. *ASCE J. Irrig. Drain. Eng.* 115(2):305-311.
- Cundy, T.W., D.S. Parks, and W. Zhang. 1989. Field evaluation of the runoff response of a forested plot. *Hydrological Science and Technology: Short Papers*, American Institute of Hydrology, 3(1-2):11-14.
- Zhang, W. and T.W. Cundy. 1989. Modeling of two-dimensional overland flow. *Water Resour. Res.* 25(9):2019-2036.
- Springer, E.P. and T.W. Cundy. Predicting overland flow response: effects of spatially-varying soil properties. IN: *Watershed Planning and Analysis in Action*, Symposium Proceedings of IR Conference, ASCE, Durango, CO. July 9-11, 1990.
- Benda, L. E. and T.W. Cundy. 1990. Predicting deposition of debris flows in mountain channels. *Canadian Geotechnical Journal*, 27:409-417.
- Sugden, B.D. and T.W. Cundy. 1990. Characterization of soils in a forested hillslope hollow in the Cascade mountains Washington state. IN: *EOS, Trans. Am. Geophys. Union*, 1(41) and presented at the 37th Annual Pacific Northwest American Geophysical Union Meeting, Sept. 13-14, 1990, Seattle, WA.
- Cundy, T.W. and J.L. Fridley. 1991. Bridging the gap - forest engineers play important role in maintaining and enhancing water quality, *Agricultural Engineering* 72(3): 21.

- Lettenmaier, D.P., R.D. Harr, and T.W. Cundy. 1991. Effect of forest practices on downstream flooding in the northwestern U.S. IN: Proceedings of the International Hydrology and Water Resources Symposium, National Conference Publication No. 91/22. Perth Australia, pp. 365-368.
- Jackson, C.R., B.D. Sugden, and T.W. Cundy. Comparison of piezometric response measured in a shallow-soiled hillslope hollow with response predicted using a 3-D finite element model. EOS, Trans. Am. Geophys. Union, 22(44):167 of Supplement, 1991.
- Sugden, B.D., C.R. Jackson, and T.W. Cundy. Factors affecting subsurface hydrologic response in steep hillslope hollows, Cascade mountains, Washington. EOS, Trans. Am. Geophys. Union, 22(44):186 of Supplement, 1991.
- Harr, R.D. and T.W. Cundy. November 1990 floods of western Washington State, U.S.A. IN Proceedings of the Inter-praevent 1992 Symposium on Protection of Habitat Against Floods, Debris Flows and Avalanches, Bern, Switzerland, June 29-July 3, 1992.
- Jackson, C.R. and T.W. Cundy. A model of transient, topographically - driven, saturated subsurface hillslope flow. Water Resources Research, 28(5):1417-1427, 1992.
- Luce, C.H. and T.W. Cundy. Modification of the kinematic wave-Philip infiltration overland flow model. Water Resources Research, 28(4):1179-1186, 1992.
- Miller, S.M., Cundy, T.W., Murphy, D.L. and P.D. Richards. Using digital terrain data and conditional probability to evaluate landslide hazard. In: Proceedings of the 32nd Annual Conference of the International Erosion Control Association. February, 2001.
- Purser, M.D. and T.W. Cundy. Changes in soil physical properties due to cable yarding and their hydrologic implications. Western Journal of Applied Forestry, 7(2):36-39, 1992.
- Connelly, B.A. and T.W. Cundy. Cumulative effects of forest management on peak streamflows during rain-on-snow events. IN: Proceedings of the Annual Meeting of the American Institute of Hydrology, Portland, OR, October 17-22, 1992.
- Luce, C.H. and T.W. Cundy. Parameter identification for a runoff model for forest roads. Water Resources Research, 30(4):1057-1069, 1994.
- McGreer, D.J., Cundy, T.W. and J.A. Gravelle. Mica Creek Cumulative Effects Study. IN: Watershed Management, Planning for the 21st Century, pp. 300-309. ASCE Water Resources Engineering Division. San Antonio, TX, 1995.

Schult, D.T., and T.W. Cundy. Stream structures for fish habitat restoration in Potlatch creek, Idaho. IN: Watershed Restoration Management, Physical, Chemical and Biological Considerations, pp. 57-66. American Water Resources Association. Syracuse, NY, 1996.

Ice, G., Loehle, C., Beebe, J. and T. Cundy. Calibrating and Validating Hydrologic Model Performance for a Forested Watershed in a Snow Regime: The Dueling Model Mica Creek Watershed Study. Second Federal Interagency Hydrologic Modeling Conference, Las Vegas, NV July 29-August 1, 2002.

Ice, G., Dent, L., Robben, J., Cafferata, P., Light, J., Sugden, B., and T. Cundy. Programs assessing implementation and effectiveness of state forest practice rules and BMPs in the west. Water, Air and Soil Pollution: Focus, 4: 143-169. Kluwer Academic Publishers. Netherlands. 2004.

Brooks, E.S., Boll, J., Hubbart, J.A., Link, T., and T. W. Cundy. Long-Term Continuous GIS-Based Modeling of Forest Land Use Changes in Mica Creek Watershed in Northern Idaho. 2005 ASAE Annual International Meeting, Tampa, Florida. July 17-20, 2005.

Chen, C.W., Herr, J., Goldstein, R.A., Ice, G. and T. Cundy. Retrospective Comparison of Watershed Analysis Risk Management Framework and Hydrologic Simulation Program Fortran Applications to Mica Creek Watershed. Journal of Environmental Engineering, ASCE, September 2005:1277-1284.

RESEARCH GRANTS (and other support):

- | | |
|---------|---|
| 1983-84 | University of Washington. Graduate School. \$9550 for field and lab equipment. |
| 1983-84 | University of Washington. Graduate School. \$4940 for comparison of meteorologic variables in the open and under forest cover. |
| 1984-85 | USDA McIntire-Stennis. \$10,320 to evaluate the effects of clearcut logging and high-lead yarding on soil water properties. |
| 1984-85 | US Park Service. Part of \$90,340 to monitor precipitation and streamflow quantity and quality with a particular interest in acidity (with C.C. Grier and K.A. Vogt). |
| 1984-85 | US Forest Service. \$22,430 to model debris flow runout in the Oregon Coast Range (with T. Dunne, Geological Sciences). |
| 1985-86 | US Park Service. \$78,300 to continue and expand monitoring of |

precipitation and streamflow quantity and quality (with C.C. Grier).

- 1985-86 USDA McIntire-Stennis. \$10,320 to continue evaluating the effects of clearcut logging and high-lead yarding on soil water properties.
- 1985-88 US Geological Survey. \$49,788 to evaluate effects of vegetation and microtopography on infiltration and runoff (with T. Dunne, Geological Sciences).
- 1986-87 US Park Service. \$83,000 to continue monitoring of precipitation and streamflow quantity and quality (with R.L. Edmonds).
- 1987-88 US Park Service. \$84,000 to continue monitoring of precipitation and streamflow quantity and quality (with R.L. Edmonds).
- 1987-88 US Forest Service. \$45,000 to develop a model for sediment delivery to channels by landslides and debris flows (with P. Schiess).
- 1988 USDA McIntire-Stennis. \$30,000 to develop and test time series approach to cumulative effects assessment (with K.J. Raedeke).
- 1988 US Geological Survey. \$3,500 to evaluate hydrophobic soils in the Angel burn in southwestern Oregon.
- 1988-89 US Forest Service. \$39,000 to evaluate the effect of forest cover and elevation on rain-on-snow and the delivery of water to the soil surface.
- 1988-89 US Park Service. \$89,000 to continue monitoring of precipitation and streamflow quantity and quality (with R.L. Edmonds).
- 1989-92 National Science Foundation. \$265,000 to conduct modeling and field studies of the hydrology of hillslope hollows (with T. Dunne, W. Chu, L. Fritschen).
- 1989-90 San Diego Supercomputer Center. Twenty service units to support hydrologic modeling of hillslope hollows with T. Dunne, W. Chu and L. Fritschen).
- 1989-90 US Forest Service. \$22,500 to continue rain-on-snow research.
- 1989-90 US Forest Service. \$9,468 to evaluate the effects of forest management related landslides on stream channels in Canyon Creek basin.
- 1989-90 US Forest Service. \$16,800 to study sediment transport processes in high gradient headwater streams in forested watersheds.
-

1990	US Forest Service. \$10,300 to develop an overland flow model for forest road surfaces.
1990-91	US Park Service. \$89,500 to continue monitoring of precipitation and streamflow quantity and quality (with R.L. Edmonds).
1990-91	US Forest Service. \$11,500 to continue rain-on-snow research.
1990-91	US Forest Service. \$21,000 to continue sediment transport research.
1991-92	US Forest Service. \$15,000 to develop a model for assessing cumulative watershed effects from forest harvesting.
1991-92	US Forest Service. \$33,000 to study hyporheic zones in western Washington streams.
1991-92	US Park Service. \$68,625 to continue monitoring of precipitation and streamflow quantity and quality (with R.L. Edmonds).
1991-92	Weyerhaeuser Co., Washington Forest Protection Association, and King County Surface Water Management. \$90,190 to develop a model for assessing cumulative watershed effects from forest harvesting (with D.P. Lettenmaier and R.D. Harr).
1992-93	US Forest Service. \$2900 to continue rain-on-snow research.
1992-93	US Forest Service. \$20,000 to continue sediment transport research.
1992-93	US Forest Service. \$19,995 to continue hyporheic zone study.
1992-93	US Forest Service. \$24,000 to conduct a watershed condition survey including landslide and channel analysis in the North Fork Calawah River.
1992-93	US Park Service. \$66,000 to continue monitoring of precipitation and streamflow quantity and quality (with R.L. Edmonds).
1992-93	US Park Service. \$9,000 to continue monitoring of precipitation and streamflow quantity and quality (with R.L. Edmonds).
1993-97	US Forest Service. \$130,000 to evaluate hydrologic response from various harvesting levels (with S.M. Bolton).
1993-95	US Forest Service. \$55,000 to incorporate land-sliding into 3-D visualization, landscape analysis computer program (with J.L. Fridley and S.M. Bolton).